

# **TRANSLATING EVIDENCE INTO PRACTICE: A CASE STUDY ON THE PREVENTION OF VENOUS THROMBOEMBOLISM USING THE JOANNA BRIGGS INSTITUTE MODEL OF EVIDENCE-BASED HEALTH CARE.**

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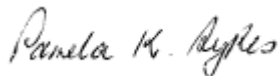
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# **ABSTRACT**

## **Translating Evidence into Practice: A Case Study on the Prevention of Venous Thromboembolism using the Joanna Briggs Institute Model of Evidence-Based Health Care.**

Getting the best available evidence into daily routine practice at the bedside is necessary to benefit patients and health care budgets. Easily understood and ready available synthesised evidence is not sufficient on its own, it also requires evidence-based knowledge translation strategies and interventions that take into consideration all levels and aspects within the organisation. The science on knowledge translation is still evolving with a multitude of theories, frameworks and models being postulated.

Review and comparison of three translation research methodologies are described in this study. The rationale for selecting the Joanna Briggs Institute (JBI) model of evidence-based health care in a practical case study on the prevention of venous thromboembolism (VTE) in an acute tertiary referral teaching public hospital is provided. A planned and systematic approach to the implementation of best practice on this topic was undertaken utilising the JBI on-line resources and action research methodology. This required careful consultation and collaboration with senior clinicians by credible change agents, the provision of evidence and data relevant to individual specialties, the implementation of change strategies addressing individual, group and organisational barriers, and measuring the effectiveness and impact of changes over time.

Lessons learnt from this process not only inform the study hospital on the effectiveness of the selected knowledge translation method but also contribute to the conversation within the scientific literature through the publication of three papers. The key publication describes the practical case study using the JBI implementation model and is accompanied by two further papers that provide examples of knowledge that have evolved from two of the action research cycles. These describe the use of computerised clinical decision support systems as an

aid to knowledge translation and how a consumer focus group informed the production of a patient education video.

This study is an important critique of the JBI model for evidence-based health care and its applicability for continued use in the study hospital as a feasible, appropriate, meaningful and effective model for evidence implementation. The JBI model is a conceptual framework that incorporates four integral and interdependent components: evidence generation; evidence synthesis; evidence/knowledge transfer; and evidence utilisation. The evidence utilisation component of the JBI model relates to the implementation of evidence into practice and reflects a planned action model. It provides a frame of reference for organised thinking and a structured and logical step-by-step progression through the planned action phases, underpinned and guided by the on-line resources. Improvements in compliance with three of the four evidence-based audit criteria were observed in the initial action cycle. The variable success was not attributed to a failure in the JBI model but was contributed to by contextual and logistical barriers mostly identified at the organisation level.

The study hospital has a proven commitment to the implementation of evidence-based practice and translational research. Current and previous activities using the JBI model, coupled with the small, but growing, number of staff with training and/or experience in using the JBI tools, has seen a growing recognition and support for the model within the organisation. The JBI model is a feasible, appropriate, meaningful and effective method for evidence utilisation, subject to ongoing funds. The intended application of the study hospital to qualify as a JBI collaborating centre and ultimately to gain internationally recognised JBI endorsement, places the study hospital on a clear pathway to improving patient and health/systems outcomes and bridging the evidence-practice gap.



# CHAPTER ONE: INTRODUCTION AND LITERATURE REVIEW

## 1.1 Introduction

The slow translation of evidence into practice is a priority challenge for governments, health care organisations, professionals and patients. The benefits of both new and existing treatments, diagnostics and therapies are being denied to patients. In addition, unnecessary, ineffective or potentially dangerous care is often being provided. This situation requires urgent action and increased accountability by all key stakeholders, including funders, researchers, policymakers, practitioners and even patients. In response to this dilemma, over the past decade a new paradigm for knowledge translation has emerged and is still evolving. The volume of complex and sometimes conflicting information on this topic, however, has become overwhelming and in fact contributes to the ongoing and unclear roadmap of getting research from the bench to the bedside.

The primary purpose of this unconventional thesis is to select an appropriate research implementation methodology after a review of the field and then provide a critique of the chosen approach following its testing with a practical case study on the prevention of venous thromboembolism. Within this process there are three publications. The first reports on a best practice implementation project using the chosen methodology, the second reports on consumer engagement in the production of a patient education video, and the third discusses the usefulness of computerised clinical decision support systems as an aid to implementation. A statement of co-authorship is available in Appendix 1.

Translating evidence into clinical practice is one of the most technically difficult phases in the research process. Despite this understanding, progress in applying and evaluating practice methodologies is slow. The point of this study is to select and road test one of the methods of knowledge translation in order to inform a health service wide effort to conform to best practice. Three different knowledge translation models will be compared and contrasted and one selected for testing in a best practice implementation project on the prevention of venous thromboembolism in an acute care, tertiary-referral, teaching, public hospital

setting. The feasibility, appropriateness, meaningfulness and effectiveness of the selected model for translating evidence into clinical practice and its impact on change within the organisation will be the guide for critique.

In this chapter, the background and importance of knowledge translation as a health care priority are discussed, as well as a review of the current literature based on the different phases identified in the knowledge translation process.

## **1.2 Background**

There is an increased awareness of the gap between clinical practice and the findings of research. Morris et al. (2011) claims it can take on average up to seventeen years for the findings of research to be embedded into routine clinical practice. The increasing level of public investment in research at all levels should demonstrate direct benefits to patients (Kitson 2008; Tabak et al. 2012). There is a practical need by both funders and researchers to share responsibility for how the research will translate into practice (Kitson 2008). However it can also be argued that clinicians and hospitals are slow and at times resistant to implement the best available evidence leaving primary researchers perplexed and frustrated. The increasing demand for health services, amidst claims the current rate of health care spending is unsustainable, creates an urgency to ensure consistent, effective and efficient clinical practice and outcomes based on the best available evidence. Although the translation of research findings into practice is argued to be an integral part of the research process, it is more complex than the simple requirements for clinical trials.

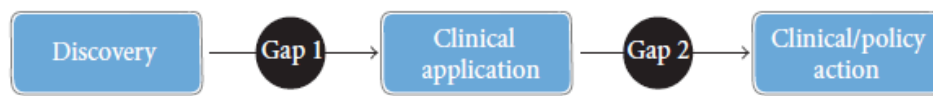
Studies, across decades, show that many patients receive inappropriate, unnecessary or potentially harmful care. For example Schuster et al. (1998) and Grol (2001) state 30-45% of patients do not receive the recommended care according to the best available evidence and that 20-25% of care is actually not needed or is potentially harmful. Similarly, McGlynn et al. (2003, p.2641) reported the results from a study of common medical conditions in over 7000 patients that '...overall, participants received 54.9% of recommended care...'. More recent Australian data reported by Runciman et al. (2012) also showed only 57% of the recommended care was being provided to patients. The World Health Organisation (WHO 2004, p.v) has realised the serious nature of this situation,

stating, '... stronger emphasis should be placed on translating knowledge into action to improve public health by bridging the gap of what is known and what is actually done'.

The extent of new research and evidence that is being published makes it difficult for health care providers and decision makers to keep up-to-date. Attempts to make this evidence more easily available and understandable in a synthesised format has seen the evolution of evidence-based medicine that provides a hierarchical grading of the evidence and the establishment of entities, such as the Cochrane Collaboration and the Joanna Briggs Institute, that provide 'plain language summaries' according to the principles of evidence-based practice. Ready availability of research findings are important as they can influence decisions at many levels through, for example, caring for patients, developing clinical practice guidelines, commissioning of health care, developing health prevention strategies, developing policy, designing education programs, performing clinical audit. Their effectiveness can only be measured if both clinicians and researchers work together to get the research into clinical practice.

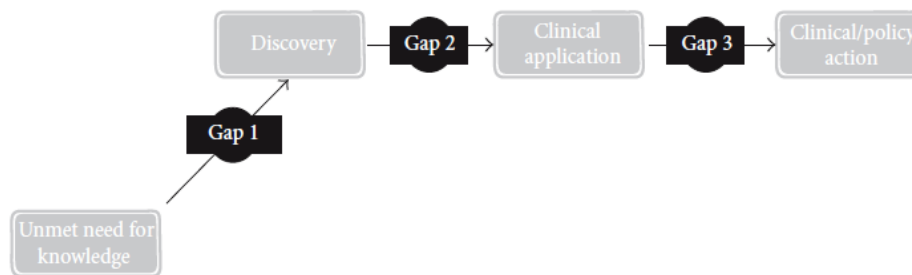
Gaps are evident between what researchers discover and what clinicians practice. There are many reasons for the failure in getting research into practice and these include the lack of appropriate information at the point of decision making and social, organisational and institutional barriers to change (Chaudoir et al. 2013; Damschroder et al. 2008; Boyko et al. 2012). Woolf (2008, p.211) describes two translational blocks from the 'bench to the bedside' and then from the 'bedside to practice' (Figure.1). The bench to bedside translational block refers to the transfer of new understanding of disease mechanisms, laboratory-based research, new methods of diagnosis, therapy and prevention and the first testing in humans. The bedside to practice translational block refers to the translation of results from clinical studies into everyday clinical practice and health decision-making. This requires knowledge of implementation science and the necessity for clinicians and policy makers to keep abreast of new knowledge that is readily available and usable in the practice settings.

**Figure 1. Two Translation Gaps in Health Care Knowledge**



The JBI refers to three gaps, see figure 2. Pearson et al. (2011) describe gap one as the gap between ‘knowledge needs’ (as identified by patients, the community, clinicians, governments and organisations) and the work undertaken by scientists and researchers during the ‘discovery process’. Gap two is the gap between ‘discovery research’ (theoretical, epidemiological, or ‘bench’ style research) and ‘clinical research’ (experimental trials including but not limited to drug trials). Gap three is the gap between ‘clinical research and ‘action’.

**Figure 2. JBI Three Translation Gaps in Health Care Knowledge**



The traditional notion, initially fuelled by the evidence-based medicine movement, that getting evidence into practice is straightforward and simply a matter of informing clinicians that new evidence exists and they should change their practice, has shifted. Kitson (2008) states there is now widespread recognition that implementation requires whole system change. This requires ‘...multiple strategies to address the nature of the evidence-based practice topic, the manner in which the evidence is communicated to those who deliver care, and the context in which they work’ (Titler et al. 2007, p. S53). The rise in interest in translation science has created much commentary and attempts to make primary research teams responsible and accountable for implementation. This requires a very different skill set which is not evident in researchers. On top of this, theorists have developed a range of models, advice and case studies, thereby adding to

the confusion on what is the best approach to adopt in the clinical practice setting.

I am a clinical academic with long experience as a change agent in the study context. To overcome these problems I will review the literature and road test one selected knowledge translation method with the intention of informing the study organisation about the suitability and efficacy of this approach in practice.

### **1.3 Knowledge Translation**

Knowledge translation is considered a cross-cutting, nonlinear process that involves not only recent research findings but also knowledge that is created from the dynamic interaction of people who come together to solve public health problems, to learn, and ultimately to drive productive change (Pablos-Mendez & Shademani 2006, p.81).

In this section of chapter one, a more detailed discussion will highlight the growth in terminology associated with knowledge translation, discuss factors surrounding the evidence-practice gap, outline three mechanisms for translating evidence into practice, consider the impact of theories on knowledge translation and then journey along the knowledge translation process by reviewing the current literature in relation to each of the identified common phases or steps for getting research into practice.

#### **1.3.1 Terminology and Definitions**

A multitude of terms are used in the literature that refer to aspects of the concept of getting knowledge into practice (Black et al. 2012; Strauss et al. 2009c; Curran 2011; Grimshaw et al. 2012; McKibbon et al. 2010; Estabrooks et al. 2006). More commonly used terms include knowledge translation, knowledge transfer, knowledge exchange, research utilisation, implementation, dissemination and diffusion. These different terms often cover related and overlapping constructs. They are often used interchangeably and it is difficult to find meaningful and consistent definitions despite the growing interest and awareness in the topic (Graham et al. 2006).

Knowledge translation is the term gaining prominence and is the phrase being endorsed most widely (Graham et al. 2006; Black et al. 2012). The term was first

coined by the Canadian Institutes of Health Research in 2000 (Canadian Institutes of Health Research (CIHR) 2010, para. 1) who define it as:

A dynamic and iterative process that includes the synthesis, dissemination, exchange and ethically sound application of knowledge to improve health, provide more effective health services and products, and strengthen the health care system.

This definition incorporates many of the concepts represented in the other terms used but it also broadens this understanding by including the critical component of applying the knowledge to improve outcomes. The primary purpose of knowledge translation is to address many of the challenges in translating what is known from research and knowledge synthesis, and the implementation of this knowledge by key stakeholders with the intention of improving health outcomes and efficiencies in the health care system (Graham et al. 2006; Ellen et al. 2014). The CIHR definition of knowledge translation reflects this purpose and for these reasons the term knowledge translation will be used throughout this master's thesis.

### **1.3.2 Evidence-Practice Gap**

#### ***Quality Chasm***

The landmark 2001 Institute of Medicine report 'Crossing the Quality Chasm', identified that high rates of misuse, underuse, and overuse of health services have created a 'chasm' between best evidence and medical practice. Many studies since have reported high quality evidence is still not consistently applied in practice despite the obvious benefits to patients and health budgets. Often cited examples include the under-prescribing of statins in post stroke patients (LaRosa & Vupputuri, 1999), the over-prescribing of antibiotics for children with upper respiratory tract symptoms (Arnold and Straus, 2005), the high level of dissatisfaction by patients with the information being given to them and the lack of citable evidence being used in policy-making processes and even clinical practice guidelines (Lavis et al. cited in Strauss et al. 2009c).

### ***Evidence-based medicine to evidence-based practice***

The evidence-practice gap is why knowledge translation is needed. The evidence-based medicine movement aimed to optimise decision-making by emphasising the use of evidence from well designed and conducted research and generating recommendations based on the strength of the evidence. However, there is no clear evidence that the dissemination of research findings via publications, presentations, systematic reviews or even guidelines have a direct or immediate impact on practice. It is still a 'hit and miss' process despite the clear benefits to patients and demonstrated cost savings (Cooke & Walker 2013, p.2). Recognition that gaps between evidence and decision making occur across all decision makers, including patients, health care professionals, and policy makers and at virtually every level of health care has yielded the broader term evidence-based practice (Strauss et al. 2009b).

### ***New strategies needed***

New methods to operationalise effective evidence-based practice are necessary in addition to current methods that are based on the principles of evidence-based medicine, such as continuing medical education, continuing professional development, and the generation of clinical practice guidelines (Black et al. 2012; Davis et al. 2003). These are passive strategies and weak effectors of behaviour change. The knowledge translation audience is much broader than just medicine and strategies will vary according to the targeted user and the type of knowledge being translated (Straus et al. 2009c). There is a need to move away from the biomedical approach to using evidence to a broader knowledge translation approach where social mechanisms for facilitating knowledge exchange between individuals and groups is applied (French et al. 2009).

### ***Contributors to existing evidence-practice gaps***

Some progress has been made in advancing the knowledge translation field (Stetler et al. 2008; Rycroft-Malone. 2007; Chaudoir et al. 2013) but gaps still exist. After reviewing the literature, many possible reasons for this are identified and are listed below:

- ❑ High quality usable evidence is still not always available at the point of decision making, despite the best efforts of evidence-based medicine (Greenhalgh et al. 2014; Elliott et al. 2014);
- ❑ Knowledge translation is still not well understood at the political, organisational and individual levels (Dramschoeder et al. 2008; Kislov et al. 2014);
- ❑ Competing and conflicting goals of the various core actors have created a long-standing cultural divide between researchers, clinicians and policy-makers, often referred to as 'silos', and this contributes to the slow transfer of created knowledge (D'Andreta et al. 2013; Roland 1995; Pablos-Mendez & Shademani 2006; Clancy 2009; Black et al. 2012);
- ❑ Fragmented nature of the health care context (Kislov et al. 2014);
- ❑ Practitioner perceptions that optimal care is already being delivered negates any recognition that evidence-practice gaps may exist (Black et al. 2012);
- ❑ Even when changes are implemented, more often than not they are not sustained over time (Glasgow et al, 2012; Strauss et al. 2009c);
- ❑ Routine process and outcome measurements are not collected and in the words of Lord Kelvin, 'If you don't measure it...you can't improve it';
- ❑ Implementation of the best available evidence is facilitated by attention to intervention fidelity and this is often unrecognised by practitioners (Keith et al. 2010; Rycroft-Malone & Burton 2011);
- ❑ Most knowledge translation literature focuses on 'describing' the evidence-practice gap rather than reporting methodological rigorous studies that test the effectiveness of interventions (Bryant et al. 2014).

For the purpose of this study, it is necessary to consider and, where appropriate, address these factors to ensure successful implementation of the best available evidence.

Increased accountability for bridging the evidence-practice gap is required by all stakeholders and at all levels. Governments need to take a leading role by having an increased focus on research governance and accountability and by ensuring the investment of taxpayer dollars in health research is relevant, timely, rapidly translated into policy, programs and practice and that benefits flow to patients (Canadian Institutes of Health Research (CIHR) 2012; National Health & Medical Research Council (NHMRC) 2014). It is no longer acceptable to tax payers and patients alike for researchers and funding organisations to regard their job as finished when results are published in peer-reviewed journals and relevant research does not progress to clinical practice. Dissemination requires specific academic collaboration and targeted funding. In Australia, this has been



recognised through the establishment of the NHMRC Research Translation Faculty and the many associated activities and strategic collaborations, targeted funding schemes and fellowships, ongoing funding of the Cochrane Collaboration in Australia and the incorporation of knowledge translation guides into NHMRC research funding applications (National Health & Medical Research Council (NHMRC) 2014). These strategic commonwealth initiatives are filtering down at state/ local levels and being reflected in increased academic / health care service / practitioner collaborations.

Australia also benefits from the pioneering work of the Joanna Briggs Institute (JBI), a not-for-profit international leader in the promotion and facilitation of evidence-based health care. Its original focus on nursing now extends to the allied health professions and, through their collaboration with the Cochrane Collaboration, to the medical profession.

The various entities and stakeholders all need to work together, at all levels, to try and bridge the evidence-practice gap:

Putting research into practice requires a shared understanding between policy makers, managers, purchasers and providers of health care. They all need to be involved in setting the research agenda and in disseminating and implementing the results of research. As Archie Cochrane put it more than 20 years ago, “There is a whole rational health service to gain” (Roland 1995, p.226).

Translating evidence into practice in health care is messy, complex, uncertain, and is still evolving (Kitson et al. 2008). In reality there are no ‘magic bullets’ (Strauss et al. 2009c, Dopson et al. 2002). Changing behaviour requires evaluation of the entire health care organisation and needs to be approached on an ongoing basis using systematic, purposeful and structured efforts (Kitson et al. 2008; Stetler et al. 2008).

### **1.3.3 Knowledge Translation Mechanisms**

There are various mechanisms that can influence the translation of evidence across the evidence-practice gap, each with varying degrees of effectiveness.

The Canadian Institute for Health Research's (CIHR) conceptualisation of 'push', 'pull' and 'exchange' mechanisms can inform a theoretical approach. 'Push' is the dissemination of existing research findings to relevant stakeholders; 'pull' enables stakeholders to access and use existing research; and 'exchange' efforts facilitate the sharing of experiences, needs and expectations of research agendas (Grimshaw et al. 2012).

There is a significant difference between pushing and pulling mechanisms for getting evidence across the evidence-practice gap. These are two well recognised (Estabrooks et al. 2006; Lavis 2006; Ellen et al. 2013) and very different patterns of translation that have very different outcomes and are a source of confusion and consternation. Two examples of push and pull mechanisms can be seen in the different patterns of translation as a result of the discoveries of anaesthesia and antisepsis (Webb 2013). After the first public anaesthesia occurred in Boston on 16<sup>th</sup> October 1846 for the removal of a tumour under the jaw, its translation across the world was remarkable. It was published the following month and within six months had spread globally. Conversely, years earlier in 1843, Oliver Wendell Jones Snr proposed that puerperal fever was transferred on the hands of physicians between patients, thereby conceiving the term antisepsis. In conjunction with further seminal work by Lister, Semmelweis and Pasteur, this led to the germ theory of infection and the whole package of antiseptic hand washing, surgical site preparation and washing of instruments. This took decades to be implemented and, indeed, it could be argued that the full translation of this evidence into clinical practice is ongoing.

These are two stories of different treatments or health care interventions and with very different patterns of translation. Webb (2013) suggests, in these examples, pull translation is much more effective than push translation because although both anaesthesia and antisepsis benefit patients only anaesthesia actually benefits doctors. He suggests making clinicians more accountable by measuring individual patient goals of treatment and outcomes and that this would make clinicians more responsible for pulling evidence across the evidence-practice gap. This hypothesis, however, creates a dilemma as most measurements in health care today report on aggregated rather individual patient data and process

measurements for policy purposes rather than the more difficult to measure patient outcomes.

A third and very different knowledge translation mechanism that is used is knowledge exchange or integrated knowledge translation (Strauss et al. 2009a). Amidst other terms, it is also known as collaborative research, action research or participatory research. Linkage or exchange efforts aim to bring the researcher and knowledge user communities together through an interactive process. This can occur at any point throughout the research process. Researchers and knowledge user's work together to develop and implement a dissemination strategy that is appropriate for the knowledge user audience. The collaborative approach builds relationships between researchers and knowledge users, is supported by change behaviour theories and may significantly enhance dissemination efforts (Strauss et al. 2009c).

This methodology is not relevant to all situations. It is more appropriate when addressing complex, relevant and timely 'real-life' health or health system issues that require engagement of multiple stakeholders in both research and change processes. Consistent with other related participatory action research literature, a knowledge translation integrated approach can be time-consuming, demanding and resource intensive but when used, Strauss et al. (2009c) report, it is a strong predictor that research findings will be used and have a greater impact.

A practical example of an integrated knowledge exchange is cited by Strauss et al. (2009c) where researchers, a Home Care Authority and community nurses collaborated together on improving best practice for people with venous leg ulcers. The extent of the evidence-practice gap was determined, the best available evidence identified, guidelines adapted to the local context, services re-designed to establish a dedicated venous leg ulcer clinic, and evidence-based leg ulcer care was implemented and evaluated. Favourable outcomes were significant and included an increase in healing rates from 23% to 56%, nursing visits were reduced from 3 to 2.1 per week and the median cost for each treatment decreased from \$1923 to \$406. In this instance, the implementation of best practice proved more effective and less costly than usual care.

Whatever approach is taken – push, pull, or exchange, there is significant evidence to support the premise that the dissemination of results is most effective when researchers and knowledge users already have existing relationships built on ongoing exchange of information and ideas (Strauss et al. 2009c).

#### **1.3.4 Theories, Conceptual Frameworks and Models**

There is no one theory that informs knowledge translation studies (Rycroft-Malone 2007; Estabrooks et al. 2006; Chaudoir et al. 2013), rather a wide spectrum, or ‘menu of constructs’ (Brehaut & Eva, 2012, p.1) approach for promoting implementation has been used. This usually involves inter-disciplinary cooperation and trans-disciplinary collaboration, utilising theories, empirical findings, and methods from a variety of fields that are not traditionally associated with health research (National Institutes of Health (NIH) 2013). Dissemination and implementation research studies are typically underpinned by a number of theoretical perspectives on behavioural change (such as cognitive theories focusing on rational information seeking and decision making); management theories (emphasising organisational conditions needed to improve care); learning theories (leading to behavioural approaches involving, for example, audit and feedback and reminder systems) and social influence theories (focussing on understanding and using social environment to promote and reinforce change) (Francis et al. 2012).

Conceptual models of implementing knowledge are essentially models or theories of change that require an active and co-ordinated approach (Strauss et al. 2009c; Black et al. 2012). Change theories fall into two basic categories: classic and planned change models. Classic models describe passive ways of how change occurs and are not designed to cause change (e.g., Rogers diffusions of innovation (1995)). Planned change models are designed to study and cause a particular change in a system. They refer to the deliberate engineering of change that may occur whilst working with individuals or groups with the intent always being to ‘...alter ways of doing things in social systems.’ (Graham et al. 2006, p.20). Planned action models can focus implementation

efforts and provide all stakeholders with a common script or understanding of the action plan.

Graham et al. (2006, p.20) reviewed the many theories or frameworks relating to planned action models and identified many commonalities. These have been incorporated by Graham et al. (2006) into the following eight phases:

1. Identifying a problem that needs addressing
2. Identifying, reviewing, and selecting the knowledge or research relevant to the problem (e.g., practice guidelines or research findings)
3. Adapting the identified knowledge or research to the local context
4. Assessing barriers to using the knowledge
5. Selecting, tailoring, and implementing interventions to promote the use of knowledge (i.e., implementing the change)
6. Monitoring knowledge use
7. Evaluating the outcomes of using the knowledge
8. Sustaining ongoing knowledge use

Planned action theories can further the study of knowledge translation by providing a framework to understand the change process, and to identify which implementation components were successful and which were not. At each action phase, there may be a host of theories from multiple disciplines to draw from when planning to move knowledge into action. Strauss et al. (2009c) argue, however, that data on the validity and transferability of planned action theories is limited.

This master's research is a practical case study of a best practice implementation project utilising a planned action model that incorporates these eight phases. It is appropriate to review the current literature on knowledge translation using the common phases described above as sub-headings and limiting the discussion to the acute care hospital setting because the setting for this work is a large metropolitan acute care facility.

### ***1.3.5 Phases to Knowledge Translation***

The process of knowledge translation is complex and dynamic and does not follow a prescribed logical and linear pathway (Rycroft-Malone 2004; Greenhalgh et al. 2004; Dopson & Fitzgerald 2005; Kitson 2009) – it is conditional, contextual and relational in nature and is therefore not easily operationalised (Kitson et al.

2008; Salter & Kothari 2014).

The following eight phases of the knowledge translation process can influence each other, may occur sequentially or simultaneously and the completion of one phase may influence or impact another phase.

#### **1.3.5.1 Identify the problem**

Identifying an evidence-practice gap is the starting point for knowledge translation (Strauss et al. 2009a; Graham et al. 2006). Potential triggers that can prompt further investigation include, but are not limited to, the presentation of a clinical problem in the practice setting, awareness to new or existing knowledge (e.g., a practice guideline, systematic review, conference proceedings), a result of professional review (e.g. morbidity and mortality, incident reports), in response to regulatory or accreditation processes, or feedback on performance or clinical indicator data.

It is important to ensure that any change or development initiatives are consistent with emerging key practice issues and that they fit with micro and macro policy and organizational agendas (Rycroft-Malone 2004). Once a problem has been identified, a relevant change agent can be selected as an important strategy to improve the effectiveness of the uptake of evidence. Facilitators, project leaders, knowledge brokers, opinion leaders and champions are examples of change agents (Strauss et al. 2009c; Dogherty et al. 2012; McCormack et al. 2013). In terms of theoretical orientation, facilitators and project leaders use group dynamics and interpersonal skills to promote change while opinion leaders and other change agents rely on their status, level of expertise and knowledge (Kitson et al. 1998; Dogherty et al. 2012). Credibility, role clarification and the style approach of the change agent is considered critical to the role (Kitson et al. 1998; Grimshaw et al. 2012). The selection of a relevant change agent will vary according to the needs of the target audience and the knowledge being transferred (Grimshaw et al. 2012; Strauss et al. 2009c).

From a social engagement perspective, the project should be linked to a supportive multidisciplinary team of key stakeholders with relevant expertise, interest and knowledge about the topic. Individuals' within the organisation who

are persuasive, respected or in positions of power can also be strategic inclusions on the team. Participation of knowledge users in the research process has also been reported as a strong predictor that research findings will be used in practice and will achieve greater impact:

When people in systems are given more freedom to get involved in local problem solving and in making autonomous decisions, they more actively engage in finding creative solutions to routine problems and in implementing knowledge in care settings (Strauss et al. 2009c, p. 42).

A local multidisciplinary team is seen as 'crucial' for successful local improvement by creating a sense of ownership in the change process, providing key stakeholders an opportunity to consider the evidence and helping to overcome any resistance to change (Rycroft-Malone 2004).

#### **1.3.5.2 Review the evidence**

Reviewing the literature in order to identify the best available evidence relevant to the particular clinical issue is essential. Graham et al. (2006) identify three generations of knowledge that need differentiating to ensure the appropriate selection of the best available evidence. First-generation knowledge represents the unmanageable multitude of primary studies or information of variable quality that is out there and that may or may not be easily accessed. Knowledge synthesis, or second-generation knowledge, represents the aggregation of existing knowledge. This often takes the form of systematic reviews, meta-analysis and meta-synthesis and evidence summaries. Third-generation knowledge consists of knowledge tools or products that are based on best available evidence distilled from synthesised knowledge. Synopses such as professional journal clubs, practice guidelines, decision aids and care pathways are examples of such tools (Strauss et al. 2009c).

A recent school of thought for debate has been proposed by Greenlagh and Wieringa (2011) based on a review of the knowledge translation literature for widening the conceptualisation of knowledge to include more research on (1) case-based reasoning, looking at how practitioners balance the generic recommendation of a guideline or protocol or pop-up reminder against the particularities of a case in the here-and-now, (2) tacit knowledge that is built and

shared among practitioners through communities of practice and where 'mindlines' evolve, (3) the link between power and knowledge in the health care field and how this impacts on the 'evidence hierarchy' and subsequent mobilisation of resources, (4) approaches to facilitating macro-level knowledge partnerships between researchers, practitioners, policymakers and commercial interests, and (5) the recognition of practical wisdom and case knowledge into the development, implementation and revision of clinical practice guidelines. The nature of evidence is broader than research, and also incorporates clinical experience, expertise, patient experience and information from the local context that helps meld a broader evidence base (Rycroft-Malone 2004; Kitson et al. 2008).

It is generally recommended that the use of systematic reviews, evidence summaries and/or evidence-based national and international clinical practice guidelines render the vast amount of scientific literature useful to those needing to assess and translate the best available evidence into clinical practice. The strength of the evidence needs to be critically reviewed and analysed in conjunction with the level of clinician consensus and patient preferences on the particular issue (Kitson et al. 1998). All three elements in combination can influence the uptake of proposed changes. The various types of knowledge can then be customised to address the specific problem identified and the results can be re-packaged for the specific user audience and the specific site context.

#### **1.3.5.3 Consider local context**

'Context' is an important construct in understanding and influencing successful knowledge translation (Kitson 2009; Squires et al. 2014a; Titler 2006). The ideas of relevance, organizational 'fit' and adequate resources highlight a dependence on an organisation's political and contextual agenda and investment (Rycroft-Malone 2004).

While consensus exists on the importance of context in knowledge translation studies, there is a lack of agreement on what is meant by context (Squires et al. 2014a). Various definitions exist but in broad terms context refers to the environment or the setting in which the proposed change is to be implemented. Within the literature, context has been conceptualised in different ways. Kitson



and colleagues (1998), in their development of the Promoting Action on Research in Health Services (PARIHS) framework, were one of the first to examine different dimensions of context, that includes culture, leadership and evaluation. Greenhalgh et al. (2004) have identified 'structural' (organisational size, functional differentiation, slack resources, specialisation) and 'non-structural' (culture, climate, leadership, power balances, social relations, attitudes to risk taking) as important contextual features. Hutchinson et al. (2010) identified four groups of context factors: cultural, structural, physical and social. Another study by Miegers et al. (cited in Squires et al. 2014a) identified six different contextual features from a synthesis of 10 nursing studies that included role, access to resources, support, education and time to participate in research. Squires and colleagues (2014a) are currently conducting a concept analysis to develop a framework of context for knowledge translation.

Two major elements that are discussed frequently and consistently in relation to context are culture and leadership. Cultural factors can be grouped: (1) at the individual level, and includes staff training and skills and knowledge in translation research; (2) at the unit level, that includes the attitude of opinion leaders, fragmentation of care, time, priority of demands; and (3) at the organisation level, with a focus on accreditation and regulatory recommendations, economic considerations (financial and human), infrastructure and technical levels of investment, and political, social and strategic goals. These elements, either individually or in various combinations, can all serve to positively or negatively impact efforts to implement change.

Transformational leadership, as defined by Aarons et al. (2014, p.2) is '...the degree to which a leader can inspire and motivate others...', and is recognised as having a greater effect on change implementation than transactional leadership, defined as '...providing contingent rewards'. Leaders can create a positive organisational climate, a supportive team environment, and positive work attitudes that are reflected in clarity of individual roles, teams working well together, effective organisational structures and clear leadership roles (Kitson et al. 1998; Aarons et al. 2014). It is within this context that knowledge translation activities are more likely to be successfully implemented.

Context is important and has a major influence on the knowledge translation process. This makes health care environments complex and dynamic with the need for incremental and multi-faceted change strategies to address multi-level challenges (Kitson et al. 2008).

#### **1.3.5.4 Assess barriers**

In this phase, an assessment of the likely barriers can inform the choice of knowledge translation interventions to bring about the desired change/s. Barriers to change can be working at different levels of the health care system, many of which may be outside the control of an individual practitioner. It is beneficial to identify modifiable and non-modifiable barriers and prioritise which of these to target based on consideration of 'mission critical' barriers (Grimshaw et al. 2012, p. 5).

Barriers to change can be found at the innovation level (e.g., advantages to practice, feasibility, effectiveness, accessibility, meaningfulness, attractiveness); individual professional level (e.g., awareness, knowledge, attitude, motivation to change, behavioural routines); patient level (e.g., knowledge, skills, attitude, compliance); social context level (e.g., opinion of colleagues, culture of the network, collaboration, leadership); organisational context level (e.g., care processes, staff, capacities, resources, structures); and the economic and political context level (e.g., financial arrangements, regulations, policies) (Grol & Wensing 2004; NICS 2006; NICE 2007; Boaz et al. 2011; Grimshaw et al. 2012; Haines & Donald 1998).

Various techniques can be used to examine potential barriers to best clinical practice and these include brainstorming, interviews, case studies, surveys, medical record audits, key informants, focus groups, direct observation, Nominal Group Technique, and Delphi technique (Grol & Wensing 2004; NICS 2006a; NICE 2007). Information from these can be used to inform the selection and application of implementation strategies.

There are no standardised or formal approaches to identifying barriers and so those involved in the knowledge translation process need to rely on their

combined judgement, experience and expertise to determine which barriers apply to the particular issue given their understanding of the context and the resources available to implement changes (Grimshaw et al. 2012).

#### **1.3.5.5 Implement changes**

This phase of the knowledge translation process is the one often associated with the concept of dissemination or transfer strategies and includes the planning and execution of interventions to facilitate and promote awareness and implementation of the knowledge.

Knowledge translation interventions can have a passive or active approach (Graham et al. 2006; Boaz et al. 2011; Grimshaw et al. 2012); can include a single intervention or a combination of interventions (Backus & Jones 2013); and be targeted at the individual, unit and /or organisational levels (Titler 2010). Evidence is consistent that change is more likely to occur with more planned and focussed interventions (Graham et al. 2006), however, Strauss et al. (2009c) considers the selection of knowledge translation interventions as an 'art' that is linked to the identification of barriers for change within the context.

Passive interventions such as printed and electronic educational materials (Grimshaw et al. 2012), clinical practice guidelines (Roland 1995), information campaigns (Boaz et al. 2011); didactic style education meetings (Grimshaw et al. 2012; Strauss et al. 2009c) are usually feasible in most settings and raise awareness of the desired change but should be used in combination with other methods (NICE 2007).

Active interventions such as support from local opinion leaders (Grimshaw et al. 2012; Strauss et al. 2009c; Boaz et al. 2011), educational outreach (Grimshaw et al. 2012; Strauss et al. 2009c), interactive educational meetings (Grimshaw et al. 2012; Strauss et al. 2009a; NICE 2007), clinical audit and feedback (Strauss et al. 2009a; Grimshaw et al. 2012; Boaz et al. 2011), reminder and decision support systems (Grimshaw et al. 2012; Strauss et al. 2009c; Boaz et al. 2011) and patient mediated strategies (NICE 2007) are usually more complex and costly to implement but have been shown to be more effective in achieving the desired change (Boaz et al. 2011).

Interventions can be tailored to address a specific barrier/s and/or be used in combination (multifaceted) (Black et al. 2012). The appropriateness, feasibility, meaningfulness and effectiveness of each intervention should be considered in relation to the specific context and the targeted audience (Titler 2010; Strauss et al. 2009c). Uncertainty, however, remains around the rationale for choice of interventions and whether single or multiple interventions are more effective (Grimshaw et al. 2006; Boaz et al. 2011; Titler 2006). In addition, the same interventions may meet with varying degrees of effectiveness when applied in different contexts (Titler 2006). Grimshaw et al. (2012, p. 5) reminds us that, '...evidence on the likely effectiveness of different strategies to overcome specific barriers to knowledge translation remains incomplete...' and more rigorous evaluation of intervention strategies is needed.

#### **1.3.5.6 Monitor compliance**

Monitoring compliance of the desired changes or interventions is also referred to as surrogate or process measurements (Sudsawad 2007). These focus on aggregate assessments of program effectiveness, often defined as 'improvements in care' or 'performance measurements' such as the number of tests or examinations ordered, or other similar discrete clinical activities (Salter & Kothari 2014). They are used to assess intervention fidelity and the quality of the implementation strategy, clarify causal mechanisms and identify contextual factors associated with variation in outcomes. They evaluate the quality of an embedded process (Rycroft-Malone & Burton 2011) and whether interventions have been sufficient to bring about the desired change or whether more of the same or new interventions are required. Specific process measurements need to be discussed early in the course of the knowledge translation process. What is going to be measured (end-point), how and where will suitable data be accessed, exclusions and exceptions (Agency for Health care Research and Quality (AHRQ) 2014a), and who will be responsible for analysis, reporting and feedback (Graham et al. 2006). Process measures are easier and less costly to measure than outcome measures (Agency for Health care Research and Quality (AHRQ) 2014a).

#### **1.3.5.7 Evaluate outcomes**

Measuring outcomes of the knowledge translation process evaluates whether implementation strategies actually make a difference in terms of such things as health, practitioner, and systems outcomes (Sudsawad 2007). They determine the impact of the interventions and are the only way to determine whether the efforts to promote the evidence uptake were successful and worth it (Graham et al. 2006). Outcome measures are much harder to collect, more costly and the least used. There can be technical issues relating to sufficient sample size to enable risk adjustment and the timing of measurement relative to the care received (Agency for Health care Research and Quality (AHRQ) 2014b). Hakkennes and Green (cited in Sudsawad 2007) conducted a review of 228 original studies to identify the outcome measures used to determine the effectiveness of strategies aimed at improving development, dissemination, and implementation of clinical practice guidelines. They indicated only a small number (20%) of the studies reported the reliability or validity of the outcome measures. A mixed methods approach can also be used to collect various outcome measures (Salter & Kothari 2014). In the face of these technical difficulties and the cost of collecting health outcomes data many services opt to collect surrogate or process measurements to serve as proxies for patient health states. Similar to process measurements, outcomes should also be determined early in the knowledge translation process with input and agreement by all stakeholders in order to contribute to the validity, reliability and acceptance of the outcome findings.

Process measurements measure health care while outcome measures measure health. Simply providing data isn't enough to inform local decision-making. A number of things can influence how well information is received. Services are unlikely to use information if it is difficult to find or comprehend, they doubt its validity or usefulness, or if the intended audience is not clear (Schang et al. cited in Duckett & Breadon 2014, p. 29).

#### **1.3.5.8 Sustain knowledge use**

Implementation of research findings into clinical practice is meaningful but only if results can be sustained by changes being embedded into routine daily practice. Sustainability is defined by Glasgow et al. (2012, p. 1277) as 'the long-term

integration of effective interventions within specific settings'. In this context, long term refers to the '...discrete post-implementation phase...' (Glasgow et al. (2012, p. 1277) or 12 months after implementation (Wiltsey Stirman et al. 2012; Tricco et al. 2013).

Examples of short term adherence to evidence uptake initiatives are readily available, but it is necessary to determine whether these result are more than brief periods of compliance driven by 'enthusiasm and novelty' (Lang et al. 2007). Prolonged changes in practice are required. The sustainability phase should set in motion a feedback loop that cycles through the action phases (Graham et al. 2006). Barriers to ongoing use may be different from the barriers present when the knowledge was first introduced. Graham et al. (2006) suggest the process for planning and managing the change should be the same: assess barriers to knowledge sustainability, tailor interventions to these barriers, monitor ongoing knowledge use, and evaluate the impact of initial use and sustained use of the knowledge. Results of compliance or evaluation data should be reported to all relevant stakeholders who have a direct or indirect responsibility for the particular clinical practice and/or service. This can also form part of the organisation's quality improvement program. The process, however, requires commitment to ongoing funding and resources. Health care organisations often get all the 'boxes ticked' at the completion of a project and ongoing resources are not always forthcoming to measure whether the changes have been sustained over time.

Monitoring systems and data feedback mechanisms are needed to determine relevant process and outcome factors to assess sustainability. Limited data exists, however, on how to maintain changes in order to effectively inform real-world practice. Titler (2010, p. 42) suggests actionable data feedback must persist to sustain improved performance, around which 'timeliness, individualisation, non-punitiveness and customisability' are important. Glasgow et al. (2012) recommend longitudinal observational studies to examine the course of effective interventions once implemented, as well as conducting prospective trials to test sustainability strategies in generalisable populations and settings. Assessment of the degree to which practices have been sustained can be reported by using the four-point scale of sustainability proposed by Pluye et al. (2004) that includes, (1) absent, (2) precarious, (3) weak, and (4) routinisation.

#### **1.4 Chapter Conclusion**

Getting the best available evidence into daily routine practice at the bedside is necessary to benefit patients and health care budgets. Easily understood and ready available synthesised evidence is not sufficient on its own, it also requires evidence-based knowledge translation strategies and interventions that take into consideration all levels and aspects within the organisation. The science on knowledge translation is still evolving with a multitude of theories, frameworks and models being postulated. A systematic and structured approach is recommended that incorporates specific steps or phases that are common in most models. Review of the literature has relevance to this study by providing guidance on the selection of an appropriate methodology for a best practice implementation study on the prevention of venous thromboembolism in an acute care hospital.

The evidence on best practice in venous thromboembolism (VTE) prevention programs is unequivocal and has been established for decades. It is considered a 'high priority' for patient safety by governments, professional organisations and regulatory bodies. Despite this, in the study hospital, similar to many other hospitals world-wide, an evidence-practice gap exists. There are variations in clinical practice observed between medical specialties and even between individual practitioners within the same specialty. A planned and systematic approach to implementing best practice on this topic using 'push', 'exchange', and where possible, 'pull' mechanisms, requires careful consultation and collaboration with senior clinicians by credible change agents, the provision of evidence and data relevant to individual specialties, the implementation of change strategies addressing individual, group and organisational barriers, and measuring the effectiveness and impact of changes over time.

Lessons learnt from this process can not only inform the study hospital on the effectiveness of the selected knowledge translation method but also contribute to the conversation within the scientific literature through the publication of three papers.

## **1.5 Thesis Overview**

This introductory chapter leads to the rationale for selecting an appropriate knowledge translation methodology for use in a best practice implementation study on the prevention of VTE.

In chapter two, I describe the evolution of the evidence-based medicine movement and the subsequent development of multiple knowledge translation models and frameworks that provide a methodology for getting the evidence into practice. I review three different models and justify the selection of the JBI model for evidence-based health care. A comprehensive overview of action research is provided as this will be used as the research methodology in conjunction with the Getting Research into Practice (GRiP) component of the JBI model in the best practice implementation study.

Chapter three is a compilation of three publications. The key publication describes the practical case study using the JBI model and is accompanied by two further papers that provide examples of knowledge that have evolved from two of the action research cycles. These include consumer engagement in the development of a patient education video and the use of computerised clinical decision support systems as an aid to implementation. These papers highlight the complexity and multi-faceted issues that affect knowledge translation initiatives and demonstrate a good fit between action research methodology and the JBI model.

The fourth and final chapter provides an important summary, analysis and critique of the JBI model as a feasible, appropriate, meaningful and effective methodology in the practical case study on VTE prevention. This is followed by a further analysis and critique of the JBI model and the evidence utilisation component of the JBI model and how it compares against knowledge translation framework and model assessment criteria and its applicability for continued use in the study hospital.



## CHAPTER TWO: METHODOLOGY

### 2.1 Selecting a Knowledge Translation Method

The benefits of research and the best available evidence must be accessible to patients in all health care settings. The focus of this master's study, however, is to look at effective methods for translating evidence into practice in the acute hospital setting. Review and comparison of three translation research methodologies are described with justification for the selection of one method for use as a practical demonstration on how to implement best available evidence on the prevention of venous thromboembolism in an acute care hospital. The study will raise awareness of the evidence-practice gap and highlight the need for recognition of, and leadership in, knowledge translation. It will provide real examples of the evidence-practice gap and demonstrate a proven and structured methodology that is effective and repeatable in bridging that gap. In addition, executive systems and structures will be put in place to ensure clinical governance for ongoing studies and to promote and support the development of staff skills and future clinical leaders in knowledge translation.

#### ***Evidence-Based Medicine***

Archibald Cochrane, often referred to as the 'father of evidence-based medicine' published his seminal article titled, 'Effectiveness and efficiency: random reflections on health services' in 1972, where he strongly criticises the lack of reliable evidence behind many of the commonly accepted health care interventions at the time. His criticisms spurred rigorous evaluations of health care interventions and highlighted the need for evidence in medicine. His call for a collection of systematic reviews ultimately led to the creation of the Cochrane Collaboration. This is now an international collaboration that synthesises evidence and provides summaries of research to clinicians. This work was the foundation for the movement that is termed 'evidence-based medicine'.

Preceding the knowledge translation movement was the development of a 'new paradigm' for medical practice that was described in the publication titled, 'Evidence-Based Medicine: a new approach to teaching the practice of medicine' by Guyatt et al. (1992). Wyer and Silva (2009, p.892) describe the development

of the evidence-based movement as 'a child of destiny' as it evolved from the 1970s on the back of the rise in biomedical informatics, driven by the explosion of published information related to health care and the advent of the era of clinical trials and of clinical research in general. Leading up to the 1992 article and the term evidence-based medicine, Wyer and Silva (2009, p.893) claim there were two imperatives:

1. The need to harness and codify the explosion of clinically relevant published research, and
2. The need to develop rubrics for the evaluation of such research that would facilitate literacy and informed consumption on the part of clinicians, and even the lay public.

Evidence-based medicine proposes a linear hierarchy of knowledge where clinical evidence from randomised controlled trials and meta-analyses are placed at a higher order than pathophysiological understanding of disease process, clinical experience or patient values and perspectives. It includes systematic, structured and simplified methods for the critical appraisal of the medical literature using well established criteria for assessing the internal validity of specific study designs and the grading of health care recommendations. The stated objective of evidence-based medicine has been to close the gap between research and clinical practice by providing clinicians and policy makers with information from clinical research in 'appropriately synthesised, pre-digested and conveniently accessible form' (Wyer & Silva 2009, p.892).

The explosion of medical information continued and led into the availability of information from the internet via the World Wide Web in 1995. As a result, the development of a conceptual framework known as 'information literacy' which describes a way of approaching the use of electronic medical resources and databases evolved and is defined by Wyer and Silva (2009, p.893) as:

...an ordered sequence of tasks that begins with the identification of an information need and extends through the process of performing a search, evaluating the quality of the information found and, finally, integrating it with independent pre-existing information, a process that can be summarised as 'ask', 'acquire', 'appraise' and 'apply'.

This set the scene for an entirely new relationship between the world of medical practice, health care and the biomedical literature.

Evidence-based medicine has been lauded as an important and revolutionary innovation that has gained traction and is now being adopted into other fields such as the allied health sciences, mental and behavioural sciences, education, criminal justice, and social work (Mullen & Streiner 2004). It is now more commonly called evidence-based practice or evidence-based health care to perhaps acknowledge its application to broader fields other than just medicine. It does, however, have its detractors and is controversial in some of the claims it has made.

Straus and McAlister (cited in Mullen & Streiner 2004), conveniently grouped the criticisms of evidence-based medicine as addressing either limitations or misperceptions. Limitations (Mullen & Streiner 2004, p.114) include:

- ❑ The shortage of evidence that may not be available for application into practice;
- ❑ The application of the results of trials that cannot be applied at the individual level in every circumstance;
- ❑ The need to train professionals, and for those professionals to have the time and resources required to find and critically use the evidence.

Misperceptions (Mullen & Streiner 2004, p.117) about evidence-based medicine identify that it:

- ❑ Denigrates professional practice into a form of 'recipe-like, manualised procedures' that discounts the professionals' expertise and knowledge of the individual patient;
- ❑ Ignores the patient's wishes, rights and preferences;
- ❑ Is being used by governments, and the like, as a cost-cutting tool to impose the fastest, least expensive form of intervention;
- ❑ Leads to research and therapeutic nihilism;
- ❑ Is at philosophical odds with the realities of practice in that clinical decision making relies more on common sense than scientific, rational processes.

Many of these limitations and misperceptions can be addressed through applying the tenets of evidence-based medicine to clinical decision making with wisdom and taking into account the evidence, the practice and the patient.

The evidence-based medicine movement started the process of getting clinical research into practice by critiquing and synthesising the evidence but it didn't go far enough in that it didn't provide a methodology for utilising the evidence and ensuring the transfer of evidence into practice.

Over the last seven to ten years there has been a lot more emphasis on the translation of research into practice. Various conceptual frameworks and models have been developed and described in the scientific literature. There is an international peer-reviewed journal dedicated to implementation science. Clinical units specific to implementation science or translation research have begun to be established within some hospitals. In spite of this evolution, there remains no standardised or accepted model or methodology for knowledge translation.

Here, I will review three different knowledge translation models that have been developed by three different authors / organisations: (1) The National Institute of Clinical Studies (NICS), (2) the Promoting Action on Research Implementation in Health Services (PARIHS), and (3) The Joanna Briggs Institute (JBI) Model of Evidence-Based Health care. I will provide the rationale for selecting one of these models as the basis for undertaking a best practice implementation study as part of a Master's Research degree on knowledge translation.

### ***The National Institute of Clinical Studies (NICS)***

NICS was a national agency established by the Australian Government in 2000 and was responsible for improving the evidence-practice gap in Australian health care. In April 2007, the NICS became an institute within the National Health and Medical Research Council (NHMRC). Although work continued on existing NICS programs, all new initiatives were aligned with NHMRC strategic objectives.

The initial 'evidence-practice gap' work developed by NICS focussed on the identification of barriers and enablers to implementing clinical guidelines, and the

establishment of clinical networks to facilitate evidence implementation. These initiatives were aimed at assisting health care professionals in changing practice to close the 'evidence-practice gap'.

Various enablers and barriers to change occur in different settings and at different times across all levels of the organisation and even between different categories of staff. Interventions tailored to address specific barriers and make use of specific enablers help to focus efforts with implementing clinical practice guidelines.

The NICS on-line resources provide a list of the various barriers and the level at which these barriers operate, as well as a comprehensive description of the various techniques that may be used to investigate these barriers. The types of barriers and the level at which they occur (NICS 2006a) are listed below:

- ☐ **Patient** - knowledge, skills, attitude, compliance;
- ☐ **Social context** - opinion of colleagues, culture of the network, collaboration, leadership;
- ☐ **Organisational context** - care processes, staff, capacities, resources, structures;
- ☐ **Economic and political context** - financial arrangement, regulations, policies;
- ☐ **The innovation itself** - feasibility, credibility, accessibility, attractiveness;
- ☐ **Individual professional** - awareness, knowledge.

In addition, NICS describe in detail a variety of techniques that are available for examining barriers to, and enablers for, introducing best clinical practice (NICS 2006b, pp. 5-14). These include the use of brainstorming, case studies, key informants, interviews, focus groups, direct observation, surveys, Nominal Group technique and the Delphi technique. A combination of these techniques may be used and depends on the clinical setting, the amount of funding and time available for the investigation, the intended rigor of the process and whether there is access to relevant expertise. Regardless of the technique selected, the principles of acceptability, generalisability, reliability and cost-effectiveness should be considered.

The NICS also developed the 'NICS Barrier Tool' (NICS 2006c) which consists of a basic table, with instructions that can be adapted to any particular situation and comprised of Part A- Who to involve, Part B- Barriers at the people level, Part C- Other barriers, and Part D- Overcoming barriers/achieving change.

The second arm of the NICS program was to establish a NICS network program to support evidence implementation (NICS 2006a). The program provided seed funding to 11 groups to use in developing their networks and to support them in pinpointing gaps between evidence and practice in their area of care. Two of these 11 networks received further funding for closing the priority evidence-practice gaps they identified.

The merging of the NICS with the NHMRC in 2007 has ultimately supported a more formalised program. This change is reflected in the establishment of the Research Translation Faculty that assists the NHMRC in addressing the key challenges for translation of health and medical research in Australia. The faculty oversees the development of national clinical practice guidelines and sets a standard for all Australian health care services in the development of evidence-based guidelines. In addition, the faculty oversees a number of significant funding schemes that support partnerships, projects and individual studies that promote the NHMRC priority for the rapid translation of research findings into health policy and practice. It does not, however, provide a model or research methodology for knowledge translation at the organisation, unit or individual levels.

The NICS model provides a detailed description on the need for, and how to, identify barriers and enablers that can be adapted and used at the organisation, unit or individual level as an aid to an implementation program bridging the evidence-practice gap. The limitations of this model, however, are that it does not provide a research methodology for translation and there is no focus on the quality of the evidence other than a reference to the implementation of clinical practice guidelines. It does not stand as a complete implementation model on its own merit although the materials and resources could be useful with other implementation models.

### ***Promoting Action on Research Implementation in Health Services (PARIHS)***

The second knowledge translation model under review is the PARIHS framework. It is described as a conceptual framework for guiding implementation of evidence-based practice. It evolved against the backdrop of the evidence-practice gap, the increasing rise of health care costs, a management ethos to 'do the right thing' and the drive for quality improvement. It was first described in the United Kingdom by Royal College of Nursing (RCN) researchers, Kitson, Harvey and McCormack (1998), and was conceived from a collection of 'experience and wisdom' that concluded that the successful implementation of research into practice involved the interplay of three core elements: evidence, context and facilitation. The authors proposed that in the absence of conclusive evidence, the three elements should have equal standing, contrary to the perceived tenets of the evidence-based movement. Since this first description, a larger project team has shaped its ongoing development including a concept analysis of each of the three dimensions with a research study to assess its content validity with a refined version of PARIHS published in 2002 (Rycroft-Malone et al. 2002). A conceptual exploration of evidence was published in 2004 which further detailed the framework's three core elements (Rycroft-Malone 2004). Kitson and colleagues (2008) published a further clarification of PARIHS in 2008 with an evaluation of the conceptual and theoretical thinking around the use of the framework and a proposal to utilise a two-step process to using the framework. In 2010, a critical synthesis of literature on PARIHS (Helfrich et al. 2010) was described and the development of a guide for applying a revised version of PARIHS was published by Stetler et al. in 2011. The conceptual framework continues to evolve with the ongoing need for evaluation of each iterative step.

The PARIHS conceptual framework differs from other linear and technical models in that it proposes a multidimensional conceptual framework that describes the interplay and interdependence of multiple factors. These factors include the nature of the evidence, the context in which the proposed change is to be implemented and the mechanisms by which the change is facilitated. These three elements are not linear and do not have a hierarchy of cause and effect, instead, they have equal interplay and were initially considered simultaneously but this was later revised to include a two-stage process. The preliminary stage

considers the elements and sub-elements of evidence and context as a diagnostic and evaluative measure and then uses the aggregated data from these measures to determine the most appropriate facilitation (Kitson et al. 2008).

Each element is refined to include sub-elements that are considered along a continuum from high level descriptors to low level descriptors. The level and nature of evidence is assessed by considering the sub-elements of research, clinical experience, patient preference and local data. The context of the change environment is assessed by considering the sub-elements of culture, leadership and measurement. The facilitation of change is assessed by considering the sub-elements of characteristics, role, style and skills and attributes. The assumption used in the PARIHS framework is that the best success for implementation would be where all three elements are at a 'high' level, that is, when:

...evidence is scientifically robust and matches professional consensus and patient preferences...the context is receptive to change with sympathetic cultures, strong leadership and appropriate monitoring and feedback systems...and when there is appropriate facilitation of change, with input from skilled external and internal facilitators... (Rycroft-Malone 2004, p.298).

The PARIHS framework provides a ranking of 'readiness' of the team, unit or organisation to embrace a new practice, evidence, or innovation. However, the framework has mainly been used as a 'theoretical and practical heuristic to guide research and practice development work' (Kitson et al. 2008, p.2).

A critical synthesis of the literature by Helfrich et al. (2010) found that no studies used PARIHS prospectively to design implementation studies and there was generally a lack of detail about how variables were measured or mapped, or how conclusions were derived. Indeed, there are a number of weaknesses to the framework. It does not provide specific tools to assist in the different levels of complexity or details about how variables can be measured. It does not address research production or knowledge creation as an aspect of knowledge translation and it is focused more on the clinical setting than health systems in general.

The authors concluded themselves that the greatest need is rigorous, prospective use of the framework to guide implementation projects. Bjork et al. (2013) and



McWilliam et al. (2009) both state it is not a model to guide actual implementation. Indeed, it does fall short of providing a comprehensive model of implementation but it does attempt to represent the complexity of the change process involved in implementing research-based practice.

As with the NICS model, the PARIHS model does not provide a research methodology for knowledge translation but could be a useful aid in assessing 'readiness for change' prior to using other implementation methods.

### ***Joanna Briggs Institute Model of Evidence-Based Health Care (JBI Model)***

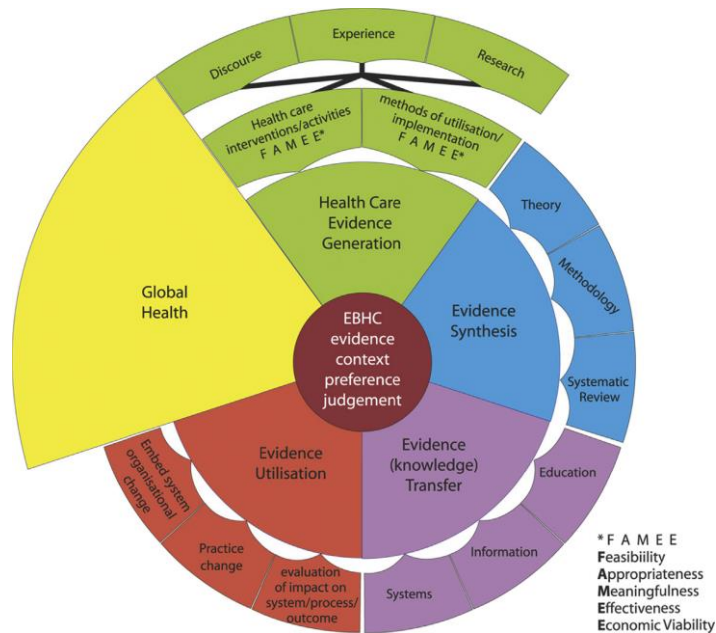
The third and final review of a model for knowledge translation is the JBI model for evidence-based health care. The Joanna Briggs Institute (JBI) was first established in 1996 and is the international not-for-profit, research and development arm of the School of Translational Science based within the faculty of Health Science at the University of Adelaide, South Australia. It currently has collaborations with organisations in over 70 countries world-wide. The JBI program and its' considerable on-line resources and support services are accessed through individual or organisational fee based membership.

The JBI model was developed by Pearson et al. (2005) and portrays the methodological thinking and framework of activity of the Joanna Briggs Institute. The model theorises that '...evidence-based practice involves giving consideration to the best available evidence; the context in which care is delivered; client preference; and the professional judgement of the health professional' (Pearson et al. 2005, p.209). The authors depict the four major components of the evidence-based health care process as:

- ☐ Health care Evidence Generation;
- ☐ Evidence Synthesis;
- ☐ Evidence/Knowledge Transfer;
- ☐ Evidence Utilisation.

Each of these four components incorporates essential sub-elements and are conceptualised as either the goal or end-point of improved global health as shown in figure 3 (Lockwood et al. 2014).

**Figure 3. The JBI Conceptual Model for Evidence-Based Health Care**



The JBI model provides reliable evidence that health professionals can use to inform their clinical decision making at the point-of-care. It includes the synthesis, transfer and utilisation of evidence through identifying effective practices to improve health care. In addition, effective clinical leadership and evidence-based practice, combined with a strategy of audit, feedback and re-audit, is a logical and systematic improvement strategy. ‘Audit and feedback has been shown to facilitate important changes in health care practice’ (Lockwood et al. 2014, p. 563) and has been validated as a mechanism for knowledge transfer by a Cochrane systematic review (Ivers et al. 2012).

The JBI, much like the Cochrane Collaboration, synthesises evidence using specific levels of evidence and grades of recommendations. Evidence is then made available in easy, usable formats to enable active uptake by practitioners at the point of decision-making and within their specific setting. For example, systematic reviews are rapidly translated into guidelines, evidence summaries, consumer (patient) information, educational programs and activities, resources for quality improvement, indicators for collection of key performance metrics indicators, and indicators for JBI evidence-based clinical audits (Lockwood et al. 2014). A unique feature of the JBI system for grading recommendations is its’

application of the F.A.M.E.E (Feasibility, Appropriateness, Meaningfulness, Evidence, Economic viability) scale that can help inform the wording and strength of a recommendation.

The JBI steps to implementing the best available evidence into clinical practice includes the identification of the health care issue; accessing the JBI evidence; developing a study proposal; utilising the Practical Application of Clinical Evidence System (PACES) as the on-line audit tool; conducting the baseline audit; establishing the project team; undertaking the Getting Research into Practice (GRiP) process of conducting a situational analysis, identifying barriers to change and developing implementation strategies/tools; conducting a follow-up audit to measure improvements and writing a report.

This methodology provides practical help to structure a research study. The JBI provides critique and synthesis of evidence in the form of an evidence summary that includes best practice recommendations and evidence-based audit criteria. The audit tools are available through the on-line PACES with the evidence-based audit criteria automatically uploaded into the program. The GRiP phase allows the project team to undertake a situational analysis including taking into account the culture of the organisation and the context of the study, and develop a plan based on the findings. Barriers to change are identified and associated interventions and resources are documented. The GRiP is implemented using participatory action research with the complexity associated with the introduction of change being achieved through cycles of collaboration, action and reflection that usually requires multiple interventions. Once this phase is complete, a follow-up audit is conducted to measure the success of the implementation strategies. Formal evaluation of the project and the audit, feed-back and re-audit cycle occurs through a formal report and/or publication.

An important component of the JBI is the provision of a training program for conducting systematic reviews and a clinical fellowship program that emphasises the importance of clinical leadership in knowledge translation. The latter is a six-month workplace program that includes two five-day intensive residencies at the

JBIs, focussing on training in evidence-based practice, developing a proposal for an implementation project, and undertaking leadership training.

There are many advantages to the JBI model including a structured research methodology - participatory action research. It utilises a proven audit – feedback –re-audit cycle. There is a strong focus on the quality and nature of the evidence. The GRIP process is versatile and flexible and allows for the identification of barriers, enablers and implementation strategies whilst taking into account the context in which the change is to occur. There is a proven step-by-step process to follow with the availability of on-line tools along with research and technical support.

The major strength of the JBI model is that it measures compliance with the best available evidence. There is a focus on intervention fidelity and on how the evidence can be applied consistently. Many 'projects' fail to get intervention fidelity with researchers prematurely measuring outcomes. The focus is on the quality of the intervention and this contributes to the sustainability of the improved practice change. There is, however, a reasonable assumption that with improved compliance with evidence-based practice, patient outcomes will improve.

The JBI model of evidence-based health care is the preferred method for use with a hospital wide, multidisciplinary best practice implementation study to be used as an example for bridging the evidence- practice gap for this master's study. A potential hybrid model can easily be implemented at the GRIP phase by utilising the NICS methods for identifying barriers and the various techniques that may be used to investigate those barriers. The PARIHS conceptual model, where the organisation's readiness for change is assessed using the elements and sub-elements of evidence, context and facilitation can also be incorporated into the JBI model.

An additional component to the above rationale for using the JBI model is that the study hospital is already an existing member of the JBI and it seems logical to maximise and utilise this existing resource, particularly in the context of the current global and local fiscal constraints.

## **2.2 Action Research**

To lend rigor to this master's study, it was decided that the cyclical nature of action research would be adopted and utilised for the 'Getting Research into Practice' stage of the evidence utilisation component of the JBI model.

### ***Overview of Action Research***

Action research creates knowledge based on enquiries conducted within a specific practical context. It is often described as a means to manage and learn from change processes in health care settings. It is based on reflection, data collection, and action that aim to improve health and reduce health inequities through involving the people, who in turn, take actions to improve their own health. Meyer (2006) argues that while action research can take many forms and styles, it contributes to common themes of improving practice and implementing change. Learning through action occurs that then leads on to personal or professional development. As a result of the change and learning processes, knowledge is generated. Baum et al. (2006, p. 854) state, '...it affirms that experience can be a basis of knowing and that experiential learning can lead to a legitimate form of knowledge that influences practice'. Waterman et al. (2001, p. 21), in their systematic review of action research, quoted one practitioner, stating it is, '...something that can take practice forward in a systematic way, while acknowledging the chaos that can be inherent in action research'. The following overview provides a critique of action research and outlines its:

- ❑ Origin - describing the various terminology, definitions and models of action research;
- ❑ Key features - the theoretical position of action research and action researchers;
- ❑ Types of action research; and
- ❑ Justifications - reasons for choosing action research as a methodology, the advantages, limitations and concerns of choosing action research as a research approach and its impact on professional development and managing change.

### ***Diverse origins of action research***

There are many influential writers that have contributed to the development of what is commonly known as action research. Thiollent (2011, p. 161) describes action research and participatory research as having ‘...distinct and even distant origins...’.

John Dewey (1933, cited in Reason & Bradbury, 2011, p. 38), an American philosopher, who wrote extensively about the ‘...need to democratise education...’ can be credited as the source of the earliest modern thinking about putting science to use in addressing practical social problems. Dewey believed practical problems demanded practical solutions. He urged educators to teach students how to think rather than teaching facts. He identified five phases of reflective thinking: suggestion, intellectualisation, hypothesising, reasoning and testing hypotheses in action. He believed education should be made more collaborative, where students formulated hypotheses which they could then test in practice. Dewey claimed that a solution to a problem could only be regarded as viable when it was demonstrated to produce desired outcomes in practice.

It is Kurt Lewin (1946), however, who is credited with coining the term ‘action research’. He was a social psychologist in the United States of America (USA) in the 1940s and expressed profound concerns and urgency for finding methods to deal with critical social problems such as fascism, anti-Semitism, poverty, intergroup conflict, minority issues etc. (Susman & Evered 1978). Lewin’s concern was that traditional science was not helping in the resolution of critical social problems. His major contributions to the concept of action research was the belief that people are more likely to act upon problem solving decisions if they are democratically involved in the process. Lewin also was the first to declare the action research process as a cycle for the purpose of generating theory and bringing about social change through action. Waterman et al. (2001, p. 1) report he described ‘...several stages of action research including fact-finding, planning, action and reflection/evaluation, refining the problem’.

Action research had a parallel but independent development in Britain during the same years that Lewin was formulating his ideas in the USA. It began with a World War II group, which later formed the Tavistock Institute of Human Relations (Susman & Evered 1978). This interdisciplinary group drew more on psychoanalysis and social psychiatry than on social and experimental psychology, but had the same premise as Lewin, in that '...change begins with the involvement of those directly affected' (Bradbury & Reason 2011, p. 45). Early field studies undertaken by the Tavistock Institute, using highly reflective and collaborative methods, included work with army mental casualties, officer selection and coal mining practices. The coal mining studies laid the foundation for socio-technical systems theory but were not considered true examples of action research. Further experimental studies around the world blended action research and social technical systems to explore the nature of technical systems, social systems and the work relationship structures that bring the two systems together.

Participatory action research, a later refinement of action research, evolved from consciousness raising practices and the liberation theory in the 1950s and 1960s, in social, religious and educational contexts under the influence of Neo Marxist theorists such as Habermas (1972). Paulo Friere (cited in Thiollent 2011) was a notable South American revolutionary who applied critical social science and promoted liberation ideals that have been influential in action research internationally. These approaches have found numerous applications in social science contexts, particularly education and primary health. During the late 1980s and 1990s, these trends merged into a consistent alternative methodology in opposition to conventional research design and methods derived from positivism.

Bradbury & Reason (2011) acknowledge a legion of contributors to the evolution of action research traced back to Aristotle's work on praxis and phronesis, the important origins found in working within cultures, the Marxist dictum that the important thing is not to understand the world but to change it, the educational work of Friere, the participatory research practice of those working for liberation of the oppressed and underprivileged, and the influences of the gender, feminism and race perspectives. Other roots of action research lie in the practices of

experiential learning, psychotherapy and even some spiritual practices of inquiry. Action research does not draw on one but many sources of theoretical inspiration: pragmatic philosophy, critical thinking, the practice of democracy, liberationist thought, humanistic and transpersonal psychology, constructionist theory, systems thinking and complexity theory (Reason & Bradbury 2011).

Carr and Kemmis (1986), two Australian educationalists, argued that three conditions are necessary for action research to exist. First the subject matter must involve a problem in practice which is susceptible to improvement. Second, the project is conducted in a cyclical fashion incorporating planning, action, observation and reflection. Third, the project involves practitioners.

Action research is a truly worldwide and interdisciplinary movement. Action research practices can be found in community development, organisation and business, education, health care and medicine, social work, and the human, psychological and transpersonal sciences (Reason & Bradbury 2011). Interest in action research in the health care setting is increasing with recognition of the theory practice gap and the evidence-based practice gap highlighting the lack of implementation and impact of research in routine clinical practice.

### ***Definition of action research***

Action research is referred to by many different names and has been applied in many different settings. It is participatory in nature, which led Kemmis and McTaggart (2000) to describe it as participatory action research, as mentioned above. It can also be referred to as community-based research, co-operative enquiry, action science, action learning, and collaborative enquiry. There is no universally accepted definition of action research. There are many examples documented (Koshey et al. 2011; Reason & Bradbury 2001, 2006, 2008, 2011; Hopkins 2002; Cohen & Manion 1994; Winter & Munn-Giddings 2001) but Waterman et al. (2001, p. 11) provide a comprehensive and inclusive description:

Action research is a period of inquiry that describes, interprets and explains social situations while executing a change intervention aimed at improvement and involvement. It is problem-focused, context-specific and



future-oriented. Action research is a group activity with an explicit critical value basis and is founded in a partnership between action researchers and participants, all of whom are involved in the change process. The participatory process is educative and empowering, involving a dynamic approach in which problem identification; planning, action and evaluation are interlinked. Knowledge may be advanced through reflection and research, and qualitative and quantitative research methods may be employed to collect data. Different types of knowledge, including practical prepositional, may be produced by action research. Theory may be generated and refined, and its general application explored through the cycles of the action research process.

The length of this quotation does credit to the complexity that action researchers encounter in practice. They address complex problems, in complex situations, drawing on a range of methods appropriate to the research whilst working democratically.

### ***Purpose of action research***

The primary purpose of action research is to produce practical knowledge that is useful to people in the everyday conduct of their lives. Reason & Bradbury (2001, p.2) describe it as working towards practical outcomes and about ‘...creating new forms of understanding, since action without reflection and understanding is blind, just as theory without action is meaningless...’ and that the participatory nature of action research ‘...makes it only possible with, for and by persons and communities, ideally involving all stakeholders both in the questioning and sense making that informs the research, and in the action which is its focus’. The principal aim of carrying out an action research project is to support a researcher or group of researchers in studying an aspect of practice, to study it in-depth, to plan and implement action, and to learn from their experiences.

Action research is often selected to resolve complex problems and its participatory nature and process is ideally suited to monitoring the process and the outcomes of change and leads to the development of new knowledge about relevant and appropriate practices, services and organisational structures.

### ***Key features of action research***

Within the context of the JBI model of evidence-based health care, in particular the 'evidence utilisation' component using the PACES program, and its practical application in this master's study, I have identified the following key characteristics of action research that are pertinent to the research being undertaken at the study hospital. They include:

1. Participation: this is the key to success as solutions to problems require knowledge and experience from all stakeholders. The partnership is collaborative, multidisciplinary and includes multiple stakeholders. It should have a democratising effect that ensures power equality. Participants perceive the need to change and are willing to play an active part in the research and the change process. The group takes ownership of the project and the research is conducted with 'participants' rather than on or to 'subjects'. Lingard et al. (2008, p. 461) describes this partnership:

...by being based in emancipatory social theory and designed to democratise the research process, action research is an iterative process in which researchers and practitioners act together in the context of an identified problem to discover and effect positive change within a mutually acceptable ethical framework.

The researcher is the facilitator of change, working with the participants in the situation to help generate ideas for developing and integrating research and to have the full involvement of the people who will be directly affected by the research. Collaboration between the participants and the researcher assists in developing relevant and pertinent research questions. The collaborative partnership extends across each stage of the research – from identifying the problem to the disseminating of results. Expertise is essential to solving problems and value is given to both expert and local knowledge. This can be academic, research, professional or local knowledge expertise. All these different forms of expertise are acknowledged and valued for their unique contribution.

2. Local context: with action research, the focus is on issues of interest by the group. It is situation-based and context specific. It highlights concerns about the theory-practice gap in clinical practice. Practitioners often have to rely on

their intuition and experience in many situations since traditional scientific knowledge, for example, results of randomised controlled trials, often do not seem to fit with the uniqueness of their situation. Action research is one way of dealing with this as it draws on the practitioner's situation and experience and can therefore generate findings that are relevant to them.

3. Cyclical reflection: action research uses a natural cycle of act, review, act, review to achieve its two outcomes of action (e.g. change) and research (e.g. understanding). It achieves the action outcomes by involving people in the planning and the action and by being flexible and responsive to situation and people. It achieves its research outcomes mostly by following action with critical reflection. Action research is presented as a cycle of problem identification, planning, implementation and then critique or critical reflection. It alternates between action and critical reflection as it moves forward. Action research would be used if wanting to achieve understanding and change at the same time. It can begin with an imprecise question resulting in a possible imprecise answer initially but these can then help to refine questions and methods. Each cycle can be a step in the direction of better action and better research. There are cycles within cycles and this can be a very flexible and responsive process. People affected by the change are involved in the action and critical reflection. Understanding is widely shared and so is commitment to any planned change. Participant reflection is a key aspect of action research, leading to greater awareness of the problem and actions for intervention. Group reflection is a good mechanism for reviewing the quality of the research. The reflection is regular, critical and systematic. Its strength is open communication and collaboration, which enables reflection to be effective and transferrable into practice. The emphasis is on taking action on an issue. Each cycle includes vigorous seeking of disconfirming evidence adding to research rigor. With action research there is a simultaneous contribution to social science (knowledge) and social change (practice).
4. Research methods: action research embraces a variety of research methods. The ultimate aim of action research is to create more democratic, just, fair, and/or sustainable human situations. This may involve the use of theories and methods from the physical sciences or interpretative frameworks from the humanities. Action research is a strategy for professional researchers/experts

and local stakeholders to engage in a process of (1) knowledge creation, (2) action design, and (3) evaluation of outcomes. Greenwood (2007, p. 133) states, '...no theory, method, or technique is ruled out if a particular situation requires its use and using it does not violate the rights of any participants to be treated as collaborators in the action research process'. Positivism, with its focus on quantitative research methods and data processing, does not always have applicability in the social setting or human context. Usually, the contextual nature of action research studies means that it is not possible to get the numbers required for experiments. Participatory research, however, emphasises qualitative methods and techniques of collecting documentary, verbal and visual data. The most commonly used techniques include narrative and episodic interview, focus groups, case study, life story and discourse analysis, action research or various forms of participatory research (Thiollent 2011). The opposing approaches between qualitative and quantitative methods is not absolute and Thiollent (2011, p. 164) cites Cresswell (2008) as suggesting, '...a quali-quantitative compromise is sought, perhaps being more tenable than the polarized positions'.

5. Generates theory grounded in action: theory provides a guide for what should be considered in the diagnosis of a problem as well as generating possible courses of action to deal with the problems of participants. This is the case for psychoanalytic theory, Lewinian field theory and general systems theory (Susman & Evered 1978). A critical stand must be assumed in the production of knowledge. It is not only about responding to immediate demands, the aim is to build new knowledge, criticising the current situation and proposing possible courses of action and strategies. Furthermore, action research contributes to the development of theory by taking actions guided by theory and evaluating their consequences. Theory may then be supported or revised on the basis of the evaluation.

### ***Theoretical position of action research***

Action research is a specific method of conducting research by health care practitioners with the ultimate aim of improving practice and is therefore always seen as political (Koshy et al. 2010). The knowledge derived from all types of research depends on the range of approaches taken and varies according to the

context of the study, the beliefs held, the strategies employed and the methods that are used. Koshy et al. (2010) draw on the knowledge and constitutive interests described by Habermas (1972) and position action research within a research paradigm (a collection of assumptions and beliefs that guides the research and interprets the findings) by discussing the positivist, interpretivist and participatory worldviews.

1. Positivist paradigm is based on a belief in an objective reality which can be gained from observable data – often referred to as the scientific method, where knowledge is based on careful observation and measuring the objective reality that exists ‘out there’ (Cresswell, cited in Koshy et al. 2010, p. 12). This method relies on quantitative measures and the relationships between variables are highlighted. The purpose of this approach is to generate knowledge to explain and control the world.
2. Interpretive paradigm was developed in the social sciences and allows for a departure from positivist constraints. Qualitative methods such as phenomenology, ethnography, grounded theory, and narrative research are used within this paradigm, which is based on the belief that knowledge is socially constructed, subjective and influenced by culture and social interactions. The purpose of interpretive approaches is to generate a better understanding.
3. Participatory worldview describes the most influential philosophical perspective underpinning action research in health care as ‘critical social theory’. This arose from a desire to democratise research in order to present a challenge to the institutionalisation of research which was viewed as being ‘...exclusive and exploitative’. One aim here is to encourage those who are actually excluded from the process of informing it, thereby making it participatory. Linked to this is a desire for social improvement – acting on the conditions of one’s situation in order to change them (Meyer, 1995) and that to study practice means to change it, but also, that practice is changed in order to study it (Kemmis and McTaggart, 2000). Waterman et al. (2001) maintain that this approach value is attached to both qualitative and quantitative research methods and these are seen as complementary.

The uniqueness of action research is its participatory nature, its focus on context and its involvement in actions designed to change local situations, and therefore fits the participatory worldview. Another aspect of action research, however, is its inclusion of a variety of research methods and therefore the positivist and interpretivist worldviews are not excluded. Thiollent (2011, p. 164) proposes a compromise:

This view of plurality of methods, operating in a multi-paradigmatic space, currently seems like the most adequate epistemological stand, which avoids attitudes of truth monopolisation. It is an open position, with no imposition of predetermined procedures, conducive to dialogue between various actors whose knowledge is different.

When selecting and making a decision about the methodology to use and adopt while also reporting on findings, Koshy et al. (2010) argue that researchers need to consider and declare their ontological and epistemological stance and understand the implications of doing so with regard to data collection and analysis. Ontology (theory of being) includes the development of strategies to determine peoples' social reality – what exists, what it looks like, factors that make it up and how these factors interact with each other. This reality is socially constructed and not external and independent. Meaning is given to the social reality through the interpretations of the researchers' experiences and dialogue. Blaikie (1993, p. 6), states, '...the stories they tell will be based on subjective accounts from the people who live within their environment'. The methods of data collection for an action researcher will be consistent with their ontological stance – usually qualitative methods. Epistemology (theory of knowledge) on the other hand, presents a view and justification for what can be regarded as knowledge, '...what can be known and the criteria that knowledge must satisfy in order to be called knowledge rather than beliefs (Blaikie 1993, p. 7). For empirical researchers, knowledge is certain and can be discovered through scientific method. For an action researcher, the nature of knowledge and what constitutes knowledge are different. The type of data collected is more subjective and insights are of a unique and personal nature (Burrell and Morgan, 1979). What people say and how an action researcher interprets what they do and say are important for knowledge creation in action research (Koshy et al. 2010).

### ***Types of action research***

In addition to the various worldviews and ontological and epistemological stances that can position action research within a certain paradigm, there are also different classifications of action research types. Whitelaw et al. (2003) highlight three broad types of action research in the literature including, (1) the technical-scientific and positivist type with the intention to link research to action operating within a traditional scientific method, (2) the mutual-collaborative and interpretive type, where policy makers, researchers and field practitioners come together within the context of the research to identify problems, their possible nature and a range of likely interventions, and (3) the critical and emancipatory type which sees research as an explicit vehicle for political and critical expression. This type of action research values notions of participation, empowerment and emancipation. The majority of action research literature advocates this approach. An alternative typology proposed by Hart and Bond (1995) for health services identifies four basic types of action research: experimental, organisational, professionalising and empowering. These are associated with seven basic criteria:

1. Educative;
2. Deals with individuals as members of social groups;
3. Problem focused, context specific, and future oriented;
4. Involves change intervention;
5. Aims at improvement and involvement;
6. Involves a cyclic process where research, action and evaluation are linked;
7. Is founded on a research relationship in which participants are involved in the change process.

There are many reasons to choose action research. Waterman et al. (2001, p. 21) list the main reasons for choosing an action research approach. It encourages stakeholder participation, results in change, involves a cyclical process including feedback, contributes to understanding, knowledge and theory, solves practical / concrete / material problems, educates, acknowledges complete contexts and complex problems, embraces a variety of research methods, evaluates change, and empowers and supports participants.

### ***Advantages and limitations of action research***

Meyer, in Gerrish and Lacy (2006, p. 268) summarises the advantages of using action research when:

- ☐ There is no or little current evidence to support or refute current practice;
- ☐ Poor knowledge, skills and attitudes exist;
- ☐ Evidence-based practice needs to be developed;
- ☐ Gaps have been identified in service provision;
- ☐ Services are underused or deemed inappropriate;
- ☐ New roles are being developed and implemented;
- ☐ Work is being undertaken across traditional conflicting boundaries.

The disadvantages in using action research include:

- ☐ Not being viewed as science;
- ☐ Its findings are not generalizable;
- ☐ The vulnerability of participants;
- ☐ Being dependant on collaboration;
- ☐ Difficult to achieve and sustain change;
- ☐ Feedback being potentially threatening;
- ☐ Change being hard to measure;
- ☐ Poor development of theory.

There are many advantages to action research that justify its use in health care. It is a research methodology that provides a mechanism for facilitating the translation of the best available evidence into clinical practice/settings, as well as having the ability to generate new knowledge specific to particular problems and individual contexts. There are, however, as stated above, limitations that must be recognised and addressed where possible. These can be minimised to a significant degree through rigorous attention to the processes involved in action research. Namely, strong facilitation and collaboration, use of appropriate methods, intervention fidelity, regular critical reflection, effective monitoring and evaluation and the publishing of high level, quality action research studies and findings to raise its profile and legitimacy within the scientific literature.

### ***Action research and traditional scientific methodologies***

Action research as a research methodology has gained some acceptance in certain academic areas (Walsh et al. 2008; Thiollent 2011; Koshy et al. 2010) but is often seen as a 'soft' option by some. Traditional scientific methodology, representative of analytical and quantitative research, remains dominant in both



the acceptance and validity of the research and its access to research and development funds. Traditional research relies on strict compliance with the scientific method and rules of accountability. Fundamental steps to the scientific paradigm include observation, hypothesis, experimentation and generalisation. Findings are generalizable. Stephens et al. (2009) state this applies well to the physical sciences such as chemistry, physics and biology where mathematical law can be applied but it is not so applicable to the newer sciences and the social sciences such as physiology and psychology. Thus the development of a 'softer' alternative option to positivism evolved where the use of qualitative techniques is common. Action research is the dominant paradigm in the field of social science.

The evidence-based practice movement that supports the positivist worldview is where clinical evidence from randomised controlled trials and meta-analyses are placed at a higher order than clinical experience or patient values and perspectives. The major criticisms of the evidence-based practice movement, however, include the availability and relevancy of the type of evidence in specific clinical settings and its silence in regard to implementation which remains a major barrier to getting research into practice. In addition, critics of the scientific methodology highlight the perpetual quality gap between what is publicly expected and what is deliverable in the face of rising costs and the cultural variability of scientific medicine. There are also questions of elitism, relevancy of research for poor countries, contentious clinical decisions, cultural gaps, incompetence, and unethical or criminal behaviour.

Walsh et al. (2008) also identify a more recent trend towards consumer involvement in health care including contributing to priority setting, policy making, defining research outcomes, selecting research methodology, patient recruitment, interpretation and dissemination of findings. This trend can also be identified in Australian health care priorities with one of ten national service standards (ACSQHC 2012) focusing on partnering with consumers. This service standard describes the systems and strategies to create a consumer-centred health system by including consumers in the development and design of quality health care.

This recent shift in the politics of health care towards a greater role for patients and the public in decision making creates a tension between traditional science and action research. Putting 'patients at the centre' aligns with action research that depends on the involvement of all stakeholders and the negotiation in change that is acceptable to a local public:

'Who indeed should get organ transplants? Should people who smoke get bypass surgery or pay more tax? Should nurses prescribe medicines? Should wards or hospitals be closed? Should a new service be offered? Should a new drug be offered? Traditional health science can inform such debate but the questions themselves are not solely or even primarily scientific (in traditional terms) because each one implies not only measurement but also evaluation and then, eventually, negotiation of change' (Walsh et al. 2008, p. 140).

The values of society should inform health care decisions where anyone affected by a proposal should be involved in planning it.

In contrast, there are numerous concerns raised by critics of action research. Lack of rigour and validity of findings is suggested due to questions about objectivity when researching one's own practice. Declaration of the researchers' values and epistemological stance at the beginning of the study is needed. It is argued that sharing of information with the group and the triangulation of information should ensure that the quality of information that is gathered is robust and without bias. Another criticism is that the findings of action research are not generalisable. This arises in most of the literature about action research. Action researchers claim that findings are not meant to be generalisable and are applicable only within a specific situation, within the context of the work and the researcher beliefs, which are all declared in advance. Findings, however, may be useful for those who wish to apply the ideas and findings within similar contexts or to replicate the study and this is referred to as transferability.

The problem solving approach of action research can portray the process as a 'deficit model' (Koshy et al. 2010). Action research can come about from a desire by the researchers to improve practice but if it does come about as a result of problem identification then there is nothing wrong with making progress and

developing innovative ideas and strategies to try and solve the problem. Lastly, a hotly debated issue is whether action research is considered scientific. Morrison and Lilford (2001, p. 441) identify five tenets of the action research approach that address concerns as to whether it can be considered scientific and these include, flexible planning, iterative cycles, subjective meaning, simultaneous improvement and its unique context. They take the view that, '...it is perfectly respectable to engage in an enquiry, aimed at bringing about beneficial change in a manner sensitive to context, according priority to the perspective of those directly implicated and working iteratively to increase understanding rather than mapping everything out at the start'. Action research can stand on its own merit and justify its own approach.

Stephens et al. (2009) express surprise that the proponents of scientific methodology have not embraced the significance of 'participation' from an epistemological or political stance. The convergence of science and increased patient and public involvement aligns with action research that depends on involvement. This convergence '...highlights complementarity between health science and action...' (Walsh et al. 2008, p.127). Likewise, traditional health science is relevant to the action research approach – it can be an input and an output to the process. Both methods are valid in certain situations. Walsh et al. (2008, p. 133) argue for 'complementarism' between paradigms. This complementarity may well be the point that can assist in closing the research-practice gap that is widely documented in the health care literature and that has seen the emergence of organisations, programs and journals specifically around knowledge translation and implementation science. There is, however, a need for more high level quality action research to ensure it gets the recognition it deserves and can compete for research and development funds on a more equitable basis.

The JBI model of evidence-based health care facilitates this 'complementarism' between the two paradigms. The JBI model uses empirical data for the generation of best available evidence that is effective, appropriate, feasible and meaningful to specific settings. The JBI PACES program then links this evidence to action research, with the aim of getting the evidence into practice. The

program incorporates all the key elements of action research in that it is participative, has a local context, utilises appropriate quantitative and/or qualitative methods for data collection, monitoring and evaluation, and uses cyclic reflection for learning and action that contributes to practice change and knowledge generation.

### ***Action research and professional development***

Action research is an integral part of critical professional development. Although the context of the work of Kemmis & McTaggart (1988, p. 6) is education, it is also useful and relevant within health care. They state that action research is:

...a form of collective reflective enquiry undertaken by participants in social situations in order to improve the rationality and justice of their own social or educational practices, as well as their own understanding of these practices and the situations in which these practices are carried out.

The ultimate aim of health care practitioners is to enhance the quality of provision of care for the users. In order to achieve this, in addition to formal qualifications, health care practitioners need to attend to professional development. This can be achieved when time is taken to internalise ideas and this will be more effective if it is accompanied by critical reflection. When involved in action research, health care practitioners are continually reflecting on practice and constructing their own theories based on application. Winter & Munn-Giddings (2001) emphasise critical reflection is an important feature of action research. They believe that the initiator of research learns about their own practice and that consequently action research has become a popular form of education for professional staff in which learning arises from the process of engaging in practice -based enquiry.

Elliot (1991, p. 52) states that action research improves practice by developing the practitioner's capacity for discrimination and judgement in particular complex human situations and that '...it unifies inquiry, the improvement of performance and the development of persons into their professional roles'. There are many benefits to linking up practitioners and academics when carrying out research. It encourages creative thinking by suggesting possibilities for inquiry that might not have otherwise been considered. There is support in weighing up risks and making decisions about the chances of success. It provides insight into the

process of learning to help other practitioners create best possible conditions for their own learning. It opens opportunities for co-creation of knowledge that is received with external support from academics. Support from academics includes support in the direction for searching and reviewing existing research literature on a topic, offering training in research skills of data gathering, analysis, and reflection, and writing up reports and dissemination activities.

### ***Action research and managing change***

Action research is often used as a means for managing change. It is a way of using research in an interventionist way. The researcher is both the discoverer of problems and solutions and involved in decisions about what is to be done and for what reason. Change is seen as a cyclical process where theory guides practice and practice in turn informs change. Parkin (2009) states the primary purpose of action-based research is to bring about change in specific situations, in local systems and real world environments, with the aim of solving real problems. It is context bound.

### **2.3 Chapter conclusion**

The science of knowledge translation has evolved from the perceived shortfall of the evidence-based medicine movement in providing a methodology for utilising synthesised, graded and accessible evidence in practice. A multitude of frameworks and models have been developed over recent years, but there remains no standardised model or methodology for knowledge translation. Three different models were reviewed for the purpose of selecting one model to use in a best practice implementation study on the prevention of VTE, and to form the basis of this master's research degree on knowledge translation.

The JBI model for evidence-based health care was selected as the most appropriate model for use at the study hospital. It incorporates the four major components of evidence generation, synthesis, transfer and utilisation. Best practice implementation studies are facilitated and supported through the evidence utilisation component of the JBI model using a proven strategy of audit, feedback and re-audit, with an emphasis on effective clinical leadership. This process provides a structured progression through the identified knowledge

translation steps using the 'one-stop-shop' JBI on-line tools and resources via the PACES program.

Specifically, these steps include the identification of a clinical issue or problem, accessing the best available evidence, development of audit criteria to undertake a baseline audit, dissemination of audit results, performing a situational analysis utilising the JBI Getting Research into Practice (GRiP) process to identify potential barriers and implementation strategies, identifying and implementing multi-faceted interventions, providing regular feedback to key stakeholders, performing a follow-up audit and then review. This process includes a participative, multidisciplinary team who are equally responsible for identifying appropriate interventions and then monitoring, evaluating and critically reflecting on the effectiveness of those interventions on practices and change and the success, or not, of intended outcomes.

Participatory action research was chosen as the research methodology to implement the GRiP action plan as it was perceived the complexity associated with the introduction of change could be achieved through cycles of collaboration, action and reflection. Action research can take many forms and styles, but it contributes to the common themes of improving practice and implementing change. It encourages stakeholder participation, results in change, involves a cyclical process including feedback, contributes to understanding, knowledge and theory, solves problems, educates, acknowledges complete contexts and complex problems, embraces a variety of research problems, evaluates change, and empowers and supports participants. This was viewed as a 'good fit' with the implementation of a best practice implementation study on the prevention on VTE.

Chapter three of this thesis consists of three publications that report on new knowledge gained by the participants and key stakeholders involved in the VTE prevention project at the study hospital. The first publication reports on the overall outcome of the VTE prevention project using the JBI model of evidence-based health care. Two further publications evolved from two separate action research cycles. The second paper reports on consumer involvement in the development and production of a patient education video. The third paper reports on a review

of the scientific literature on the use of computerised clinical decision support systems as an aid to implementing the best available evidence in VTE prevention programs.

## **CHAPTER THREE: CASE STUDY-VTE PREVENTION PROJECT**

Paper number one has been submitted for publication in the International Journal of Evidence-Based Healthcare on 17th June 2015 [Manuscript number: IJEBH-D-15-00029].

### **3.1 Publication One: Prevention of venous thromboembolism amongst patients in an acute tertiary referral teaching public hospital: a best practice implementation project.**

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## **Abstract**

### **Background**

Deep vein thrombosis (DVT) and pulmonary embolism (PE) are known collectively as venous thromboembolism (VTE). These conditions are possible complications in hospitalised patients that can extend hospital stay, result in unplanned readmission and are associated with long-term disability and death. Despite strong evidence, many patients do not receive optimal thromboprophylaxis. VTE prevention is a top priority in health care systems worldwide.

### **Aim**

The aim of the project is to establish a standardised hospital-wide VTE prevention program and to improve awareness of, and compliance with, best practice standards in the prevention of VTE.

### **Methods**

A multidisciplinary team utilised the Joanna Briggs Institute Practical Application of Clinical Evidence System program to facilitate the collection of pre- and post-implementation audit data. The Getting Research into Practice program was also used to conduct a situational analysis to identify barriers, enablers and implementation strategies whilst taking into account the context in which the changes were to occur. Hospital acquired VTE data was collected to monitor the impact, if any, on patient outcomes. The project was conducted in three different phases over a 2.5 year period in an acute care public hospital.

### **Results**

A comprehensive suite of professionally crafted guidelines, tools and resources were developed to facilitate clinician acceptance of evidence-based practices. Comparison of compliance results showed variable improvements with four audit criteria. Formalised patient risk assessment improved to 7.5% with the introduction of a new form. High risk patients receiving appropriate prophylaxis improved to 81% in medical and 83% in surgical patients, on an existing high background compliance rate. Fifty-nine per cent of staff attended a VTE update

education in-service. No patients received information about adverse VTE events prior to discharge. The hospital acquired VTE rate decreased slightly from 0.65 to 0.52 events per 1000 overnight bed days.

## **Conclusions**

Overall the project achieved improvements in compliance with best practice standards. A number of delays and barriers contributed to some of the planned interventions not being fully implemented at the time of the follow-up audit. Contributing factors included the lack of electronic capabilities, some processes not being fully embedded into routine clinical workflows, lack of staff time and identification of an additional organisational barrier relating to practical issues in providing patient education at discharge. A second action cycle is recommended in an attempt to further improve compliance, ensure intervention fidelity and embed practices into routine daily workflows in order to positively impact patient and organisational outcomes.

## **Key words**

Barriers; Clinical audit; Evidence-based practice; Implementation; Venous thromboembolism

## **Source of Funding**

The Royal Hobart Hospital Venous Thromboembolism Prevention Project Team received a 2013 Covidien Pty Ltd VTE Management and Prevention Scholarship for \$5,749 (inclusive of GST) for the production of a patient education video.

## Background

Deep vein thrombosis (DVT) and pulmonary embolism (PE) are known collectively as venous thromboembolism (VTE). These conditions are possible complications in surgical, medical and obstetric patients and, can extend hospital stay, and are associated with unplanned hospital readmissions, long-term disability and death.<sup>1-8</sup> Contributing factors to VTE formation are multifactorial and are summarised within Virchow's triad as venous stasis, coagulopathy and endothelial injury.<sup>1,9</sup> Most episodes of VTE are asymptomatic or clinically silent.<sup>9-15</sup> The majority will resolve without symptoms but a minority will progress to clinically apparent disease, often after discharge from hospital. Accurate diagnosis is important to prevent fatal acute PE and long term complications.<sup>9</sup> VTE is a major preventable cause of death worldwide and the most common preventable cause of hospital death.<sup>7</sup> In Australia, hospitalised patients are 100 times more likely to develop a DVT or PE compared with the rest of the community. In addition, approximately 30,000 Australians per annum are hospitalised as a consequence of VTE with an estimated 2,000 deaths resulting from VTE.<sup>13</sup>

A large and comprehensive body of evidence, including hundreds of clinical trials showing the effectiveness of thromboprophylaxis has been established for over 50 years.<sup>16</sup> A multitude of international, national and specialty evidence-based clinical practice guidelines (CPGs) have been available for more than 25 years. These identify at risk patient groups and confirm the efficacy, safety and cost effectiveness of thromboprophylaxis and optimal treatment regimes.<sup>11-15,17,18</sup> Despite this, a large percentage of patients do not receive optimal thromboprophylaxis<sup>19</sup> and VTE still remains a cause of health care associated morbidity and death. VTE prevention remains a top priority in health care around the world. It is the 'highest ranked patient safety intervention for hospitalised patients' in the United States (Agency for Health care Research and Quality);<sup>6</sup> it is a 'clinical priority' for the United Kingdom (National Health Service National Quality Board);<sup>20</sup> and the National Health & Medical Research Council (NHMRC) in Australia have identified VTE prevention as a 'priority area' to improve patient safety.<sup>13</sup> The plethora of recommendations can be confusing and although CPGs

help to navigate therapeutic options, evidence-based recommendations are not being implemented and adopted by clinicians at the local hospital level.<sup>17</sup>

The NHMRC<sup>13</sup> recommend five steps in selecting thromboprophylaxis: (1) assessment of patients baseline risk of VTE, (2) assessment of additional condition-based VTE risk factors, such as surgery, trauma or medical illness, (3) assessment of the risk of bleeding / contraindications to pharmacological prophylaxis and mechanical prophylaxis (4) formulate overall risk assessment, and (5) selection of the appropriate thromboprophylaxis.<sup>17</sup> Many preventative strategies for VTE are available with each having its own risks and benefits. The cornerstone issue is the need for thromboprophylaxis versus the risk of bleeding. Individual patient assessment is recommended as best practice<sup>9,11-15,17-21</sup> and this involves the identification of well documented surgical, patient or condition based risk factors and contraindications.<sup>5,7-9,11,13,14,17-19,21-24</sup>

Toohar *et al.*<sup>2</sup> identify that 'translating evidence into practice is a widespread problem across a range of health care settings and clinical problems.' Barriers to implementing evidence-based practice in the prevention of VTE are multifactorial. Physician knowledge, attitudes and beliefs are cited as team related barriers. An Australian study<sup>4</sup> identified three key themes as barriers to implementing best practice including: (1) attitudes to guidelines, (2) practice culture, and (3) fragmentation of care. Individual clinicians need to be convinced that change is necessary, that their practice differs from guideline recommendations and that changing to guideline recommendations will improve outcomes for patients. Practice culture is determined by team member influence.<sup>4</sup> Senior clinicians, who are the key enablers for practice change, often practice the 'art of medicine' defined as a combination of medical knowledge, intuition, experience and judgment and this often takes precedence over guidelines.<sup>25</sup> There is inherent care fragmentation with confusion over roles and responsibilities within and between teams. Multiple teams caring for the one patient are cited as a contributing factor for VTE prophylaxis falling through the gaps. No one team is clearly responsible to screen and prescribe VTE prophylaxis. Other non-team related barriers can include: poor documentation and poor clinical handover processes; passive dissemination of guidelines that has been shown to be ineffective and unlikely to transfer into improved practice;

group education activity alone has some benefit but is short-lived;<sup>6,26</sup> and the introduction of VTE risk assessment forms and prophylaxis suggestions are limited unless there are strategies to ensure the forms are filled in.<sup>6</sup>

Evidence-based practice is only possible with a co-ordinated program addressing individual, cultural and organisational constraints.<sup>4</sup> It has been demonstrated that effective change requires (1) clinical leadership, (2) increased clinician knowledge of risk assessment and prescribing, and (3) supportive systems which remove some of the individual barriers.<sup>2</sup> Recommended strategies<sup>2,4,6,7,26</sup> to improve compliance include auditing local practice, adapting CPGs to local policies and protocols,<sup>7</sup> continuing education programs, documentation aids or electronic reminders, use of order sets or checklists embedded into existing paperwork, and an iterative process of clinical audit and feedback. These appear to be straightforward strategies but are frequently challenging to implement in actual practice.

Both individual practitioners and health care organisations have the responsibility to ensure thromboprophylaxis is given to patients at increased risk of VTE. Active implementation of the above strategies has been demonstrated to increase rates of thromboprophylaxis. Sliwka<sup>26</sup> states there is a need to, ‘...stop describing the problem and focus on effective implementation strategies to change clinical practice both at point of care and the institutional level...’ and therefore solutions should be tailored to the local institutional culture.

The purpose of this article is to describe how a best practice implementation project, based on utilisation of research findings, achieved success in improving clinical practice in the prevention of VTE. The study took place at the Royal Hobart Hospital (RHH), Tasmania’s largest public hospital and the major teaching hospital of the University of Tasmania. It is a 483-bed hospital that provides general and specialty medical and surgical services. It is the referral centre for cardiothoracic surgery, neurosurgery, vascular surgery, paediatric surgery, burns, hyperbaric and diving medicine, neonatal intensive care and high-risk obstetrics. RHH compliance with current evidence-based recommendations for the prevention of VTE had not recently been evaluated and was therefore unknown. A previous attempt at implementing a statewide VTE prevention program was

unsuccessful. At the request of the Chair of the Serious Incident Panel, a small multidisciplinary project team was formed to readdress this issue using the evidence utilisation component of the Joanna Briggs Institute (JBI) model for evidence-based health care (JBI model). This involved a cyclical process of audit, feedback and re-audit.

## **Aims**

The overall aims of the project were to: (1) improve local practice in the prevention of VTE; (2) ensure practices were performed according to the best available evidence; (3) incorporate individual patient risk assessment and evidence-based thromboprophylaxis recommendations into clinical practice guidelines; and (4) utilise active implementation strategies to embed localised guidelines into routine clinical practice.

## **Audit criteria**

Evidence-based audit criteria for the prevention of VTE were obtained from the JBI Practical Application of Clinical Evidence System (PACES). Four criteria formed the basis of the audit and included:

1. A VTE risk assessment is performed on admission and documented in medical records;
2. Patients identified as being at risk for VTE have received appropriate prophylaxis management;
3. All staff have attended education update sessions about VTE prevention; and
4. As part of their discharge plan, patients and their families are given both verbal and written information about adverse events related to VTE.<sup>27</sup>

## **Methods**

### **Phase 1**

The project was conducted in 3 phases over a 2.5 year period from July 2012 to December 2014. Hospital wide guidelines for VTE prevention had not been developed although most departments, and some individual practitioners, did have a standardised approach to VTE prophylaxis. A multidisciplinary project team was established with representatives from haematology, surgery, anaesthetics, nursing, pharmacy and quality improvement. The project leader

was familiar with the JBI model and had specific training and previous experience in knowledge translation activities. The project leader was the primary person collecting the audit data. The other team members acted initially in a consultative capacity with subsequent direct engagement with implementation strategies and organisation / mobilisation of resources.

The JBI PACES program was used as an audit tool to record data and facilitate the evidence based process of change. A baseline retrospective case-note audit was conducted of March 2012 patient records. The study population included all adult patients aged 18 years or older who were admitted to the hospital with an overnight stay greater than twenty-four hours, excluding psychiatry, palliative and emergency care patients. The sample size for audit criteria one and two was determined using the JBI-PACES on-line sampling program. A stratified random sampling method was then used to select the actual sample population of 180 medical and 180 surgical patients. The surgical sample was equally divided between emergency and elective patients reflecting the usual surgical patient flow. The sample size for the third audit criteria was 1337 and included the total number of nursing, medical and clinical pharmacy staff working in the relevant wards/units. The fourth audit criterion was a convenience sample of 85 patients surveyed on discharge from a medical, surgical and a specialty ward.

## **Phase 2**

The project team reviewed and compared the findings of the baseline audit against the best practice standards for the prevention of VTE. Major evidence-practice gaps were identified for criteria 1, 3 and 4 with relatively high compliance identified for criterion 2. At this point the project team commenced a major pre-implementation action research cycle of consultation to ensure key stakeholders were informed about the project aims and objectives, the current evidence-base and the results of the baseline audit. The aims of the consultation sessions were to garner support for the project, seek clinician feedback on a number of key issues, gain consensus on the outcomes for the project and most importantly to listen to their specific individual, group and /or departmental experiences and to identify any potential barriers to implementing best practice that may emerge. To

further engage local clinicians, the project team commenced the collection of data on hospital acquired VTE events.

In this phase, the Getting Research into Practice (GRiP) component of the PACES program was used to undertake a situational analysis to identify enablers, barriers, implementation strategies, and resources required to develop and implement an action plan. The report generated by the GRiP program was distributed to the project team members to oversee and collaborate in the implementation phase. Actions and responsibilities were allocated to various project team members and progress was monitored at regular meetings. Participatory action research<sup>28</sup> was the chosen methodology for implementing the changes and this involved four major action research cycles based on the four evidence-based audit criteria.

The implementation phase involved a number of interventions. These included the development of a hospital wide protocol specifying set processes, documentation requirements and specific staff roles and responsibilities; the design of new standard adult and ante- and postnatal risk assessment forms; eight professionally crafted individual department practice guidelines, establishment and implementation of a multidisciplinary education program for existing staff; development of an on-line eLearning module for orientating new staff; introduction of a patient education pamphlet; production of a patient education video for viewing on the hospital television education network channel; and a desktop icon for one-stop access to all the above resources. A summary of the barriers, strategies, resources and outcomes identified in the GRiP process is shown in Table1. Staff received feedback via unit meetings and education sessions at regular intervals throughout the implementation phase to facilitate compliance. Any barriers arising during the project were resolved in consultation with the project team.

### **Phase 3**

A second retrospective audit of case notes was conducted of November 2014 hospital records, using the same methodology and sample sizes applied during the baseline audit. The project leader was responsible for entering the data into



the on-line JBI PACES program. The findings of the audit were shared with the stakeholders and team members.

### **Ethical considerations**

Ethics approval (low risk) was obtained from the Tasmanian Health and Medical Human Research Ethics Committee (Approval no. H0012529). The study involved audits based on clinical practice identified via review of patients' notes and without any direct patient contact by auditors. Usual care was provided to patients as per standard hospital practice. Any information obtained during the course of the audits was treated confidentially and did not lead to any identification or contact with any individual patient.

### **Results**

#### **Initial audit**

The baseline audit results showed zero compliance with audit criteria 1, 3 and 4 that included individual patient VTE risk being assessed and documented on admission; staff attending VTE education update sessions; and patients and their families being given both verbal and written information about adverse VTE events on discharge. Compliance with audit criterion 2 was relatively high with 78% of medical and 71% of surgical high-risk patients identified as receiving appropriate prophylaxis.

#### **Post implementation audit**

A post-implementation audit was undertaken to determine any changes in compliance. There were varying degrees of improvement observed between the baseline and the follow up audit as shown in Figure1. There was an increase in compliance with documenting VTE risk assessment (criterion 1) from 0% to 7.5% (27/360). Another increase was observed in the prescribing of appropriate thromboprophylaxis (criterion 2), on a background of an existing high rate of compliance identified in the baseline audit. Appropriate prophylaxis increased from 78% (122/156) to 81% (139/171) in high risk medical patients, and increased from 71% (85/120) to 83% (128/155) in high risk surgical patients. Significant hospital wide multidisciplinary education sessions resulted in an improvement in compliance with criterion 3 from 0% to 59% (785/1337) of

relevant staff attending VTE prevention update sessions. This included 49% (446/912) nursing staff; 78% (312/398) medical staff; and 100% (27/27) clinical pharmacy staff. Baseline and post implementation patient discharge surveys identified 0% compliance for patients receiving either verbal or written information about VTE adverse events on discharge (criterion 4).

Rates of hospital acquired VTE events were collected over a two-year period from January 2013 to December 2014 as shown in Figure 2. The definition used for hospital acquired VTE was a clot first discovered during the course of hospitalisation or discovered within 30 days of a prior hospitalisation.<sup>29</sup> There were 69 hospital acquired VTE events identified from 105,507 (0.65) overnight patient bed days in 2013, and 55 hospital acquired VTE events identified from 104,758 (0.52) overnight patient bed days in 2014.

## **Discussion**

This study has achieved improvements in compliance with best practice in the prevention of VTE. Getting research into practice is multi-layered, multi-faceted, multi-dimensional, complex and dependent on internal and external forces and resources that are usually context specific and constantly changing. A number of delays and barriers contributed to some of the planned interventions not being fully implemented by the time the follow up audit was conducted. The extensive time delay between the audits is attributed to the long pre-implementation phase involving:

- Project team time constraints;
- Ongoing and extensive clinical consultation of acceptable risk factors, contraindications and specialty thromboprophylaxis regimes;
- Time taken for submission of funding applications;
- External contracting for scriptwriting and video production; and
- Lengthy hospital approval processes.

A second action cycle is recommended in an attempt to further improve compliance, ensure intervention fidelity and embed practices into routine daily care.

The study utilised a 'project-status' model of change management that is often associated with a defined timeframe for implementation after which funding and

support is often withdrawn. As demonstrated in this study, translating evidence into practice in health care is messy, complex and uncertain,<sup>30</sup> and often can't be 'boxed' into a predetermined time frame. In addition to this, achieving success in changing practice also needs to be sustained in routine daily care over time. The project received no additional hospital funding and team members volunteered their time amidst existing clinical and administrative workloads. During the project, and in recognition of the complexity and broad scope of the project, the project leader and the anaesthetist were allocated additional 'protected' time. There was considerable buy-in by all members of the project team who were proactive and contributed to each step in the implementation process. This was measured by good attendance at regular meetings, responsiveness and timely feedback to electronic communication, provision of staff education in-services, participation in promotional activities, and facilitation of 23 department consultation sessions. This support is reflected in the establishment of a complete evidence-based, hospital-wide VTE prevention program.

Context is an important factor in the assessment of a practice setting and its 'readiness for change'.<sup>31</sup> Positive contexts for successful knowledge translation are characterised by transformational style leadership, empowering and learning work environments, open feedback on work performance and organisation size.<sup>31,32</sup> The RHH is a large tertiary referral teaching public hospital characterised by a strong and supportive leadership style and a culture that includes decentralised, independent and autonomous decision-making, a patient-centred approach to the provision of high quality, safe, evidence-based care, and a highly qualified and competent workforce where continuing professional development is fostered and encouraged. Receptiveness to change at the organisational level, however, is hindered by a background of major health service reform, clinical re-design, hospital re-development, redundancies, financial constraints and limited infrastructure and information systems to support routine measurement and feedback on clinical performance. It was on this complex and challenging background that the project team proceeded with due consideration to the feasibility, appropriateness, meaningfulness and effectiveness of implementation strategies and limited resources.

Project outputs included the development of a comprehensive suite of guidelines, tools, and resources on the prevention of VTE. These have not in themselves been effective in changing professional behaviour to comply with best practice standards, but they have importantly served to create awareness to the best available evidence on VTE prevention, clarify roles and responsibilities, and facilitate compliance with internal and external documentation requirements. In addition to these resources being available, changes in practice were measured against JBI evidence-based audit criteria using a cyclical process of audit, feedback and re-audit.

The absence of an existing hospital-wide VTE prevention program at the RHH was a critical barrier to evidence-based practice in VTE prevention at the organisation level. This was particularly evident in relation to criterion 1, where an individual patient VTE risk assessment tool was not available for staff to complete within 24 hours of admission, accounting for zero compliance at baseline audit. Specific evidence-based medical and surgical VTE risk factors, as well as contraindications to pharmacological and mechanical prophylaxis were discussed at the consultation sessions, with consensus reached. There was general agreement by senior doctors during the consultation phase that ‘...formal documented VTE risk assessment is required and should already be occurring.’ Medical staff accepted they should perform and document the VTE risk assessment based on their existing requirement to document a patient assessment and history on admission and their responsibility for prescribing VTE prophylaxis on the medication chart. The greater issue was the negative response to another form needing to be filled in amidst busy workloads and plethora of existing paperwork. Strong feedback was received that the risk assessment form needed to become a part of the existing admission paperwork and be embedded into routine clinical workflows.

In response to these concerns, the project team investigated the option of introducing an electronic reminder/alert. This would be displayed on entry into the patient digital medical record and linked to an electronic VTE risk assessment form that, once completed, automatically generated VTE prophylaxis recommendations based on the identified risk factors and contraindications. Electronic reminders and computerised clinical decision support systems (CDSS)

are proven to be very effective in improving compliance with evidence-based practice in VTE prevention programs<sup>3,33</sup> but their success and sustainability is dependent on them being fully integrated into an electronic medical record (EMR) and associated computerised physician order entry system. The RHH, similar to most other Australian public hospitals,<sup>34</sup> has not progressed far enough along the continuum towards a complete EMR<sup>35</sup> to introduce a CDSS that could be easily incorporated into routine clinical workflows.

Despite clinician support and a solid evidence-base for the introduction of this gold standard system, the RHH did not have the information technology infrastructure, funding or software systems to implement these capabilities. A paper-based CDSS consisting of a VTE risk assessment form and associated VTE order set outlining recommended prophylaxis regimes based on the individual patient risk stratification was the only viable alternative. Strieff<sup>36</sup> outlines a number of barriers to paper-based order sets in that they are time consuming to locate and complete; are not part of the normal workflow for order entry; are resource intensive in tracking performance given the large patient volume; are visually challenging due to the large number of risks/contraindications and the corresponding variety of prophylaxis options; and claims the information can be too general. In addition, the project team found a paper-based CDSS was resource intensive to implement with significant issues in embedding the paperwork into routine clinical workflows and admission paperwork with a resulting minimal compliance of 7.5% reflected in the follow up audit. Although paper-based CDSS have been shown to have some clinical benefit in health care, computerised CDSS are deemed to be far superior.<sup>33</sup>

It was anticipated that increased compliance with criterion 2 on a background of existing high baseline audit results may be difficult.<sup>37</sup> RHH clinicians, despite the absence of a VTE prevention program, informally considered VTE risk status and prescribed appropriate prophylaxis. The majority of medical units, and some individual practitioners, had a standard VTE prophylaxis regime based on the principal diagnosis or surgery type rather than consideration of a standardised evidence-based approach including the assessment of individual patient risk factors and contraindications. One group of junior medical officers raised concerns in the consultation sessions about cultural processes surrounding the

investigation, diagnosis and cessation of VTE prophylaxis. Improvements in compliance were achieved in 3% of medical patient (81%) and 13% of surgical patient (83%) thromboprophylaxis rates.

Throughout the consultation sessions, some concern was also expressed about the generalised nature of some of the evidence particularly for orthopaedics who stated, '...we regularly review and "agonise over" this complex world-wide issue', and for neurosurgery who stated, '...we regularly review this topic through our journal club'. As a result of the consultation with key stakeholders, a comprehensive body of both explicit and tacit knowledge shaped the development of eight professionally crafted<sup>38</sup> and localised department practice guidelines. These guidelines provided essential specialty group information on pharmacologic and mechanical prophylaxis recommendations, including dosage, timing and duration of therapy. Generic information for dose adjustments, possible complications, drug information /monitoring and patient education were also included. These specialty practice guidelines are available in all relevant clinical areas in laminated hardcopy and electronic form via the hospital intranet.

A fully trained and informed workforce is essential to the implementation of evidence-based practice. This includes the provision of policies, protocols, guidelines, access to resources and appropriate education programs. An improvement for criterion 3 was demonstrated with 59% of relevant clinical staff attending an education in-service on the new VTE prevention program. The dissemination of information on VTE prevention proved challenging due to the number of staff involved and the difficulty in staff finding time to attend sessions amidst busy workloads and competing clinical and educational demands. The education in-services were supplemented with a multitude of paper and electronic resources, and a major awareness campaign through RHH participation in the inaugural World Thrombosis Day activities. In addition, the project team thought it was essential to develop a short eLearning module, with a multiple choice assessment that all new staff would be required to complete within one month of commencing employment at the RHH. A VTE prevention icon installed on every clinical desktop provides a direct link to the entire suite of RHH VTE prevention resources and programs.

Patient centred care is the key focus of health reform world-wide. Baseline audit compliance for criterion 4 was 0% as identified from the results of the patient discharge survey. The project team conducted a literature review to identify the evidence-base for best practice in patient education programs. A combined approach, using print and multimedia, was identified as optimal best practice.<sup>39,40</sup> The NHMRC pamphlet, 'Blood Clots: Reducing your risk' was readily available for download in 13 different languages and met health literacy and readability criteria.<sup>39</sup> In addition, a small scholarship was secured to fund the professional scriptwriting and media production of a 4 minute patient education video based on the findings from a consumer focus group. (Sykes & FitzGerald, 2015, in press) At the time of the follow up audit, the video was not available for patient viewing due to a combination of lengthy scriptwriting, production, and hospital approval process delays. The pamphlets are available for download and printing by nursing and other staff but this intervention was not successful for a number of reasons. Printing processes were not embedded into routine clinical workflows and a change in practice was required. The project team recognised that the provision of information to patients on discharge is also an issue at a broader organisational level. At the time of writing, staff were discussing a practical way forward with potential future plans for pre-printed and more easily accessible patient education materials and improved staff training in patient education and its' importance in a patient centred model of care.

In addition to monitoring compliance with VTE prevention evidence based audit criteria, the evaluation of patient outcomes were measured through hospital acquired VTE rates. There was a small downward trend observed between the 2 years of data and this is partially attributed to improved extended thromboprophylaxis rates in high-risk patients. Ongoing monitoring and feedback is required to determine the significance and sustainability of the trend.

## **Conclusion**

The prevention of VTE is a significant clinical and safety issue that concerns many hospitalised patients. A strong evidence-base exists to inform best practice. The evidence utilisation component of the JBI model shaped the development of a best practice implementation project on the prevention of VTE. The process

involves a proven strategy of audit, feedback and re-audit and undertaking a situational analysis to identify barriers, enablers and implementation strategies whilst taking into account the context in which the change is to occur.

Consensus on a comprehensive suite of locally adapted evidence-based resources supporting a hospital wide VTE prevention program was achieved through widespread clinical consultation sessions. The development of these resources were not in themselves effective in changing professional behaviour, but they importantly created awareness and provided the tools to enable staff to comply with best practice standards.

Measuring compliance with four evidence-based audit criteria showed varied improvements. Contributing factors for this outcome included a lack of information technology infrastructure and software systems, some processes not being fully embedded into routine clinical workflows, lack of staff time amidst competing clinical and educational priorities, and an additional barrier identified relating to organisational culture and practice change in the provision of patient education programs. A commendably high compliance rate in the number of high-risk patients receiving appropriate thromboprophylaxis is attributed to regular review of specialty evidence by professional groups.

A key stumbling block when using a 'project-status' change management model is that often funding and resources, and even support, for the project is withdrawn before the changes have been fully embedded into routine clinical practice and this remains the major challenge for this project. A second action cycle is recommended to ensure intervention fidelity and improve compliance in order to positively impact patient and organisational outcomes.



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## Tables

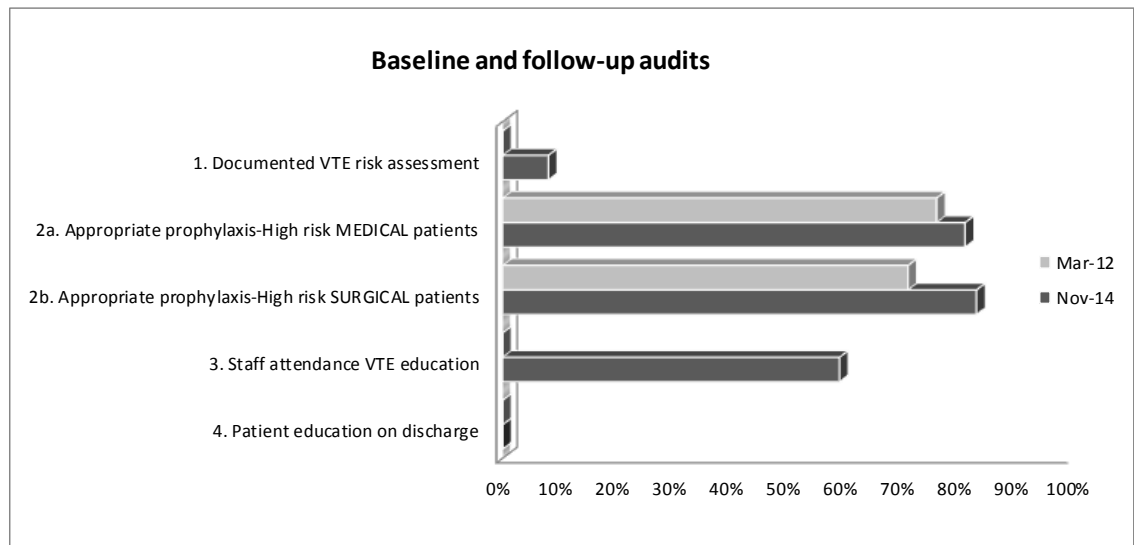
Table1. Modifiable barriers and action plan

| Barriers  | Strategies  | Resources  | Outcome   |
|---|---|--|---|
| 1. Clinician buy-in for individual VTE risk assessment                              | Clinician consultation; discussion of evidence  | Meetings; evidence-based education materials   | Clinician acceptance of evidence for individual risk assessment   |
| 2. Practice versus perception gap   | Feedback baseline audit results   | JB1 baseline audit   | Clinician awareness of evidence-practice gap  |
| 3. Dispute of some of the evidence  | Clinician consultation; discussion of specialty evidence-based literature review  | Meetings; specialty literature review  | Consensus on professionally crafted specialty practice guidelines   |
| 4. Prophylaxis not always extended for duration of risk.                            | Clinician consultation; discussion of evidence  | Meetings; specialty literature review  | Optimal regimes for extended prophylaxis incorporated into specialty practice guidelines.   |
| 5. Practice culture driven by individual clinician attitudes, beliefs and practices | Clinician consultation; discussion of evidence; feedback baseline audit results   | Executive support; meetings; evidence; JB1 audit findings  | Establishment of a standardised evidence-based hospital-wide VTE prevention program   |
| 6. Fragmentation of care  | Clinician consultation  | Meetings; hospital protocol approval   | Roles and responsibilities incorporated into hospital protocol  |
| 7. No local guidelines  | Clinician consultation; consensus on evidence   | Meetings; evidence; hospital guideline approval  | Consensus on (8) department evidence-based practice guidelines  |
| 8. No risk assessment tools   | Clinician consultation; consensus on evidence   | Meetings; evidence; hospital forms approval  | Evidence-based risk assessment forms approved for general and obstetric adult patients  |
| 9. No patient education program   | Source evidence-based pamphlet; conduct patient discharge survey and consumer focus group to inform the production of a patient education video | NHMRC pamphlet; survey and focus group findings; scholarship funds; scriptwriter; video production team; hospital TV channel   | Patient education pamphlet available in 13 languages<br>Video to be available for viewing on hospital TV channel.                               |
| 10. No formal staff education program   | Development of eLearning module for orientation program<br>Development and roll-out of VTE prevention staff education program hospital wide     | eLearning development resources; hospital on-line education website<br>Nurse educator assistance; meeting rooms with audio-visual equipment; time; attendance sheets | All new clinical staff introduced to VTE prevention program at orientation<br>All current clinical staff informed of new VTE prevention program |
| 11. No measurement and feedback   | Conduct JB1 audits and collect VTE rates  | JB1 audit findings; hospital VTE data  | Performance and outcome measurements available for evaluation of VTE program.   |
| 12. No evidence-based VTE resource  | To make all VTE prevention resources easily accessible to   | Intranet desktop icon  | Complete suite of evidence-based VTE prevention resources   |

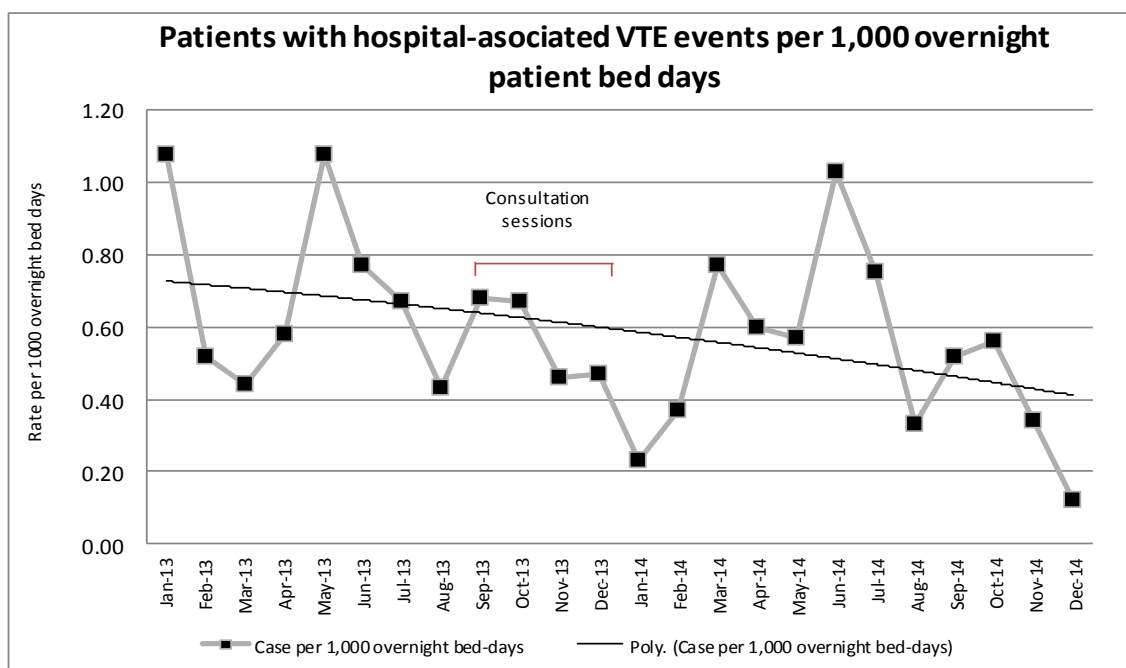
|   |  |                                  |  |
|---|--|----------------------------------|--|
|   | staff at one point                                       |                                  | available via desktop icon   |
| 13. No electronic reminder system and clinical decision support system (CDSS) | Introduce a paper-based clinical decision support system | Printing; ward clerk involvement | Evidence-based practice is supported with the introduction of a paper-based CDSS |

## Figures

**Figure 1. Baseline and follow up audit results**



**Figure 2. Hospital acquired VTE rate per 1000 overnight bed days**



### **3.2 Publication Two: Consumer engagement in the development of a video to inform health service clients about the risks and prevention of venous thromboembolism.**

Paper number two has been accepted for publication in the European Journal for Person Centered Health Care, volume 3, issue 3 [Manuscript URL: <http://ubplj.org/index.php/ejpch/author/submission/1008>]. Permission was granted on 11 August 2015 by the Senior Production Editor to reproduce the publication in this thesis.

Acknowledgments for the patient education video are available in Appendix 2.

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## **Abstract**

### **Objective**

To develop a patient education program, including an instructional video, on the prevention of venous thromboembolism.

### **Method**

A consumer focus group was conducted to garner participants' experiences, thoughts and ideas on the development of an educational video on the prevention of blood clots.

### **Results**

A combined approach using a printed pamphlet and educational video can supplement health care professional verbal instructions. Major points to inform the production of an educational video include: (1) consistency of key messages; (2) keep video short; (3) use storytelling; (4) layer and re-enforce messages; (5) demonstrate simple instructions through behaviour modelling and visual imaging; (6) use humour but interspersed with serious messages; and (7) include statistics to enhance credibility.

### **Conclusion**

The provision of quality patient education is vital and can positively influence patient outcomes. Conducting a focus group to ascertain consumer views and ideas on the introduction of a video proved beneficial and insightful for both researchers and consumers. Comparison of key findings from both the focus group discussions and the evidence in the literature were consistent. The availability of a patient education video can supplement verbal instructions but will require a practice change by staff.

**Keywords:** Focus group, multimedia, patient education, patient engagement, person-centered healthcare, venous thromboembolism, video.

## INTRODUCTION

Venous thromboembolism (VTE) is a term that includes deep vein thrombosis, a blood clot in the deep veins and the potentially fatal condition pulmonary embolism, where a blood clot breaks away and travels to the lungs. Patient knowledge and comprehension of VTE prevention strategies can promote their involvement in safety by encouraging participation in recommended activities whilst in hospital and after discharge. Strategies include early mobilisation, calf pumping exercises, adequate hydration, and compliance with thromboprophylaxis regimes, as well as self-assessment and self-reporting of VTE symptoms. Patient knowledge of the signs and symptoms for pulmonary embolism, in particular, is critical given that it is a life threatening complication and timely medical assistance is necessary [1].

A multidisciplinary project team undertook an evidence-based implementation study on the prevention of venous thromboembolism. The project was multi-faceted with one of the main domains being the establishment of a patient education program. A literature review was completed with best practice outcomes considered in relation to available hospital resources. Evidence showed that the best options for a patient education program on the prevention of VTE was a printed evidence-based pamphlet in combination with an educational video, alongside instruction from staff. This paper reports on the development of a patient education program that combines the findings of a focus group with the evidence on best practice, to shape instructions for the production of an educational video.

Patient education is an integral and essential component of health care generally. It is defined as *'... any set of planned educational activities, using a combination of methods (teaching, counselling, and behaviour modification), that is designed to improve patients' knowledge and health behaviours'* [2]. It is a primary component of an evidence-based approach to the prevention of VTE [3]. Patient understanding of VTE prevention strategies and the pivotal role they can play in their own health outcomes, however, is dependent on them receiving the right information, pitched at the right literacy level, delivered using the right modality, at the right time and with due respect for any cultural, language and socioeconomic

barriers. The provision of quality patient education from the health care perspective is especially challenging when teaching takes place in busy and complex environments [4].

Our understanding of how people learn and retain information and make subsequent behaviour change is improving. Individuals can only access and process a finite amount of information at a time. Their ability to focus and concentrate on information or working memory is impacted by their cognitive abilities and the amount of stress being experienced. In addition to the limits of working memory, the difficulty of the task or concept cognitive load may be overwhelming. Ideally, according to cognitive load theory, well designed educational materials should tax working memory as little as possible, freeing cognitive resources to process the information most necessary for successful comprehension and retention [5].

Use of technology can convey complicated ideas by picture, video and multimedia, which transcend the spoken and written word and bridge gaps [6]. A conceptual basis for the efficacy of multimedia techniques can be found in Mayer's model of multimedia learning [7], according to which, comprehension is enhanced when information is given through multiple modalities. There are two distinct channels for encoding information: an auditory-verbal channel and a visual-pictorial channel. Learning is more effective when corresponding auditory-verbal and visual-pictorial representations are both available in working memory. Multimedia instruction capitalises on simultaneous utilisation of these two separate channels. The use of visual images in video format can improve comprehension because it lessens the load on an individual's working memory.

A number of systematic reviews [2, 8, 9] identified that multimedia educational aids produced better understanding of information compared to routine methods. The concept of 'video modelling' or 'behavioural modelling' offered the greatest benefit of video presentations by facilitating knowledge acquisition, reducing anxiety and stress in both patients and family caregivers, and improving self-care behaviours [10]. Video helps to overcome educational and language barriers; illustrates the benefits of compliance versus the consequences of non-compliance; is consistent; helps layer information so learning is incremental; and

supports the use of printed information and discussions. When using video on demand, the video can be delivered when the patient is ready and willing to learn rather than when it is convenient for the health care professional [4, 5, 11]. Multimedia technology should not, however, replace the health care professional-patient interaction. Patients tended to rate the doctor or nurse as the best source of medical information [9]. Technology should supplement rather than supplant clinical-patient encounters. These findings form an emerging evidence base indicating that video-based education should be employed in the hospital setting in combination with reinforcement from clinicians and paper material [12].

However, there is limited evidence suggesting that video education is beneficial in the retention of knowledge long-term or in promoting adherence with the medical plan of care [4]. Culturally sensitive videos of appropriate length are limited in availability and producing videos is time-consuming and expensive. Lastly, routine video use will require a 'practice change' and be dependent on staff acceptance and adoption amidst busy working environments [12].

Consumer involvement is an essential but often overlooked component in the development of patient education programs. The Australian National Safety and Quality Health Service Standards require health service organisations to 'partner with consumers' and provide information that 'meets the needs of consumers' [13]. The use of focus groups and patient surveys can be important strategies to ensure consumer involvement in the development and evaluation of patient education materials, either written or multimedia [5, 14]. A focus group was conducted to garner participants' thoughts, experiences, opinions and ideas in relation to using an educational video to inform patients, families and carers on how to prevent blood clots.

## **METHODS**

Focus group methodology is a tried and tested means of eliciting consumer views in both market research and the health sciences. The model described by Lehoux et al.[15] was used to draw a group together to co-construct meaning around the experience of lay people, patients, carers or general public associated with the prevention of VTE in order to advise on the development of an educational video.

The findings of the focus group were compared with the best available evidence in order to strengthen the validity of both sources of information.

### **Recruitment**

Ten (10) consumers were invited to participate in the focus group by the Consumer Engagement Advisory Group. A mixed sample of lay people were recruited: some with experience of VTE, carers of people likely to be admitted to hospital, people who had past surgery and people with no hospital experience at all.

### **Ethics approval**

The State Social Sciences Human Research Ethics Committee approved the study. Participants were provided with written information prior to the focus group, and given an opportunity to ask further questions before signing a consent form. Participants were under no pressure to join the group and were assured they could leave at any time. They were asked to respect the confidentiality of all members of the group and assured that the facilitators would not reveal their identity in any reports.

### **Focus group**

Two hours were scheduled for the focus group but only one hour for the actual focus group discussions. There were two moderators, the first moderator set the scene and made space for the group to establish a 'common ground' for discussion. This was achieved through a brief introduction and explaining the purpose of the group. Each member of the group was then invited to say why they had agreed to join the group and what experience if any they had with the subject of VTE. The facilitator then invited a conversation that would suit the purposes of both the researchers and the group members. The second moderator observed the group and ensured that the audio equipment was functioning.

### **Data analysis**

The audio tapes were listened to immediately following the focus group and the researchers agreed on the major themes. The themes were then written up with

constant referral back to the data recordings. The literature around patient education and materials was used to complement findings from the focus group in the discussion. All participants were sent a copy of the focus group report to seek their feedback on whether the messages and ideas were captured correctly and an invitation to a second feedback session to view the video.

## **RESULTS**

The findings are reported in three themes, these being Personal Experience, Information, and Technical Aspects of the Video.

### **Personal Experience**

By way of introduction the participants were invited to talk about any personal experience they might have had associated with VTE. The narratives around their personal lives highlighted a number of facts that provided new insight for participants into VTE, as shown in Box 1.

#### **Box 1 New insights into VTE for participants**

- how common clots occur and their serious consequences;
- blood clots can occur in fit young people;
- the importance of knowing about family history and telling health professionals;
- the unusual presentation of blood clots in the upper limbs;
- concern expressed by people who were carers of less mobile people;
- general surprise at the lack of information from health professionals about the risks whilst in hospital, especially relating to surgery;
- the impact on lifestyle, such as inability to participate in sport and exercise whilst recovering;
- how the fear of getting a blood clot can impact on health care decisions; and
- Symptoms of a clot can be vague with one participant recalling they thought they had 'pulled a muscle' and yet another participant described more obvious symptoms including '...my whole leg swelled...was big and purple and very ugly'.

The everyday stories stimulated conversation and questions. The participants said that the stories were a powerful way of conveying the message about prevention of clots.

## Information

The focus group reviewed the contents of the National Health & Medical Research Council NHMRC pamphlet titled, "Blood Clots: reducing your risk". Key messages included those shown in Box 2.

### **Box 2 Key messages of the National Health & Medical research Council NHMRC pamphlet "Blood Clots: reducing your risk"**

- Being in hospital puts you at higher risk of a blood clot;
- A blood clot in a deep vein, usually the leg, can travel to the lung which can be life-threatening or if not treated, can cause long term painful leg symptoms;
- Blood clots can be prevented by having anti-clotting medicines and/or applying compression devices;
- Patients can help in preventing blood clots by staying mobile and active or if in bed, doing gentle feet and leg exercises;
- Patients are more at risk of getting blood clots if having major surgery or have serious medical conditions, and
- Know the symptoms of a blood clot in the leg or the lung and seek medical attention straight away.

Most people said their knowledge about risks and preventing blood clots was '...what I have learnt off the airlines.' There doesn't seem to be the same level of community awareness about blood clots as some other higher profile conditions, such as breast cancer.

Serious safety messages relating to blood clots are unknown. Most of the group stated they learnt something new about blood clots just from attending the focus group, including, for example, 'I didn't know you could get clots in hospital'; 'had no idea I could get a blood clot more than 30 days after surgery'; and 'no idea a clot in the leg could go to the lung and I've had two DVT now and I had no idea'. Everyone recognised it is a serious subject and that 'people need to know about it and be aware' and 'there is a lack of education'.

There was recognition that nurses play a pivotal role in relating important health information and instructions to patients about how to prevent blood clots whilst in hospital. One person said she would 'wait for the nurse to tell me if I can move or get up', and she expected the nurse to give her the correct instructions. It was

also suggested that the nurses should encourage patients to watch the video and a trigger for this could be when the nurse is giving the anti-clotting medication.

### **Technical Aspects of the video**

The focus group viewed a 4 minute Air New Zealand Boeing 777 with Rico Safety Video [16] as a starting point for discussion about a patient education video for the hospital.

The general consensus of the group about the production of a patient education video was as set out in Box 3.

### **Box 3 General consensus on the production of a patient education video**

- Keep the video short ‘...even 3 minutes... say what you need to say ...get to the point’;
- Use of humour is good but should not be too distracting from the serious message;
- It is important to have a ‘high impact message’ to capture people’s attention in the first few minutes ‘...to let patients know you need to watch this... otherwise they won’t look’;
- The combined approach of using both a pamphlet and a video was thought to be important particularly in addressing individual patient preferences;
- There are numerous benefits for watching a patient education video with one person noticing the ‘patient next door couldn’t read....it would be good for him to see a video’ and ‘you don’t always feel 100% well so we also need family to be informed’;
- The content of the video should ‘match’ the content of the pamphlet and messages should be kept simple;
- Visual messaging via the video, such as ‘...using pictures, images or gestures’ or ‘working it out from the pictures’ without the need to hear every word spoken was felt to be ‘very powerful’ and an essential component in the video construction. This would also be helpful for patients who ‘don’t speak English’;
- The group felt the use of ‘storytelling’ was very powerful and convincing and stated they would prefer to receive instructions from ‘someone they can relate to rather than a nurse or a doctor’....‘someone telling their story’...‘this is what happened to me rather than being told by an authority figure’.

The group were asked what one key motivating message could be included in the video that might persuade them to follow preventive instructions. One person



stated 'people don't realise the consequences' so using a 'story and having someone tell them that their loved one died' would be a powerful motivator. Another person suggested it is very common for people to have a 'that won't happen to me' attitude. They thought this could be counteracted by stating it may not happen to you but 'if it does, it is quite serious and can be fatal' and followed up straight away with prevention instructions and an outline of what symptoms to look for. One suggestion came from a younger member of the group who likes to see evidence in the form of statistics and thought this would make the message seem 'more serious'. Participants agreed that preventing blood clots is a serious subject and people need to know about it and how to prevent them but a 'be alert not alarmed' approach was recommended.

## **DISCUSSION**

Current requirements [17] for health services to partner with patients, families, carers and consumers to promote patient-centred care is a key element in local, national and international safety and quality programs. Consumer involvement in the development and evaluation of patient education materials, using a strategy such as a focus group, has been shown to be useful although is often overlooked or under-utilised [5, 14]. A focus group conducted to engage consumers in the planning and introduction of an educational video to inform patients and their families/carers about how to prevent blood clots highlighted existing gaps and issues in patient education programs and proved valuable in helping to guide the style, content, length, key messages and preferred availability of a video.

Participants described a variety of personal and family stories and experiences about blood clots. These narratives were diverse in content and ranged from stories about actually having blood clots and how common they are to concerns about the lack of information and education available to people in general. This confirmed other reports that patients mostly associate blood clots with long haul air flights and receive most of their information from the airlines or the media [1]. Patients, families, carers and consumers want and need more information on blood clots. 1 This was highlighted when participants realised they were unaware and not informed of the many risk factors, the serious or long term consequences, the significance of a personal or family history and that symptoms

of a blood clot can be vague and easily overlooked, thereby influencing the timely seeking of medical attention.

A patient-centred model of care wherein more responsibility is being placed on patients to participate in health care decisions and 'self-care' behaviours is associated with improved patient outcomes [4]. In this model, there is a corresponding onus on health care services to provide patients, families, carers and consumers with effective and quality health information [4, 18]. Appropriate resources are often not widely available. Significant barriers such as poor health literacy, readability issues, cultural factors, language barriers, low educational and socioeconomic status and preferred learning styles need to be considered in the development of patient education materials to ensure the right information is given in the right format at the right time [13, 19].

Using a video in conjunction with a printed pamphlet for a patient education program on the prevention of VTE was confirmed as 'a good idea' by the focus group. Availability of a printed pamphlet in addition to the video accommodates differing needs and preferences. Although most participants in the focus group liked the video concept, there was one person who would prefer reading instructional material. This approach aligns with Mayer's theory of multimedia learning that includes the benefits of using dual channels to retain information [7]. There was strong consensus that information in the video should be limited to a few key messages that are simple and easy to understand and that there should be consistency between the messages in the pamphlet and the video. Once again, this approach confirms that short messages kept brief are more likely to be retained and understood, consistent with the limitations of working memory and cognitive load theory.

Personal communication with nurses and doctors is still ranked high by patients [9] but staff are busy and time poor with competing clinical demands. There is good evidence that patient education should be considered a priority [13]. Patients, however, rely on instructions from nurses and doctors, including examples given in the focus group such as waiting for permission to get up and ambulate and being warned before surgery about compression stockings. Availability of consistent and standardised information via print and video can act

as a prompt to support busy staff, and ensure patients', families and carers receive essential preventative and safety information. Utilisation of a patient education video to supplement verbal instructions will require a practice change by staff.

The focus group participants provided valuable insight and contributions regarding the style and production aspects of making a patient education video. They had concerns about the general lack of awareness and the serious consequences of blood clots in the community that has created a 'that won't happen to me' attitude. A high impact message 'straight up' in order to grab attention is needed to ensure patients will watch the video. Hearing that a blood clot can be fatal and that it can happen to anyone was described as a powerful motivator to watch the video but a 'be alert not alarmed' approach was recommended. Incorporating national statistics to give credibility to the message was thought to be beneficial. The video should be short, maximum 3-4 minutes, making sure only key messages are included thereby lessening a patient's cognitive load and facilitating understanding and retention of information [5, 11].

Participants liked the use of humour in the Air New Zealand safety video and thought it could be used in a video about preventing blood clots but that it shouldn't overtake the seriousness of the message. Specific literature on the use of humour in multimedia patient education resources is limited. Most studies describe the use of humour in individual therapeutic encounters between a patient and a health care professional [20-24]. Humour can be a good thing when helping patients to learn what they need to know. When people laugh or anticipate something funny they are usually more relaxed, less stressed, and able to think more clearly. At these times, the skills they use to learn – like problem-solving, creativity, memory, and attention span – are enhanced [25]. Humour could be effective as an 'entertainment factor' in engaging patients to look at the video and to demonstrate self-care behaviour-modelling but should be used with caution.

Participants did not want a health care professional delivering the messages on the video. They thought they would identify better with a celebrity, patient or family member telling their stories. The basic theory behind storytelling is

narrative theory that asserts stories change attitudes and behaviours by breaking down cognitive resistance through transportation and identification. Storytelling capitalises on commonly used ways of interacting, increases personal relevance and may reduce counter-arguing. The audience is transported into the world of the storyteller and is emotionally and cognitively engaged in the narrative content. As a result the audience may be more open and accepting of the information presented [26]. Storytelling is complemented by the tenets of social cognitive theory by providing a model for designing narratives as interventions. In particular, self-efficacy is enhanced by watching others tell stories of successful behaviour change strategies. Observational learning, or vicarious experience, is another important mechanism to increase self-efficacy since behaviour is inherently situated in social interaction. Thus storytelling can be an effective strategy for sharing health promotion messages and a powerful intervention [26].

Visual messaging was raised as an important technique that should be used in the video. The use of visual images in video format can improve comprehension because it lessens the load of an individuals' working memory [5]. Patients should be able to watch the video and understand the message from the behaviour-modelling on the video without needing to hear the words. This was seen as an advantage in a busy hospital ward environment where noise and interruptions are commonplace. In addition, visual messaging was seen as being invaluable in helping to get the message across to patients with cultural, language or literacy problems. Participants agreed that availability of a pamphlet and video about preventing blood clots can support information given by staff and that there are additional benefits if this information can be referred to after discharge, either in the printed pamphlet or viewing the video *via* the hospital intranet or YouTube.

The VTE prevention project team collaborated with a professional script writer on a patient education video resulting in the creation of 'Tom Brosis...Private Detective' who set about solving the mystery of the deadly blood clot. The script was written in the genre of 'mock film noir' but was adapted to ensure suitability for the target audience. The entertaining script incorporates findings from the consumer focus group, principles of Mayer's multimedia learning theory [7] and cognitive load theory [27]. Messages were kept simple, segmented and repeated

throughout the script. The video is titled 'The Curious Case of the Deadly Blood Clot' where Tom Brosis, Private Detective, wakes up after routine surgery to notice there is something 'not quite right' with his leg. He sets about solving one of his most important cases by identifying five key clues.

The consumer focus group thought the video and the storyline was '...very well done', 'It gets the message across really well', 'I was glued to it!...' Very simple'. Everyone agreed that the video met most of the original consumer focus group key recommendations that it be short, include only a few key messages, utilise storytelling and visual messaging and be entertaining. The video was seen as being very different and quirky that would appeal to all age groups with comments including '...you could not watch that video and not talk about it after – it's doing its job on any level' and 'that is why you would keep watching it, because it was different'. The video doesn't answer every question about preventing blood clots but it does raise the questions which can be found by reading the pamphlet which is very visual throughout the video and is recommended reading by Tom Brosis '....read the book it's even better than the movie...'

## **CONCLUSION**

Patient education is a vital component of health care. Patients and carers are being given more responsibility in their disease management, making the role of patient education even more critical. Evidence suggests current programs are suboptimal. Many factors, from hospital, staff and patient perspectives, contribute to the challenges of ensuring effective and quality patient education programs. Learning is enhanced when information is given through multiple modalities. As a result of the focus group and review of the literature the following have been adopted by the VTE prevention project team, as shown in Box 4 below.

#### **Box 4 Actions adopted by the VTE prevention Project Team**

- A combined approach using a printed pamphlet and video for the patient education program;
- Consistency of messages between the pamphlet and the video;
- Short 3-4 minute video with high impact message at beginning;
- The use of storytelling is powerful and preferred;
- Key messages to be layered and repeated;
- Simple instructions to be communicated using behaviour modelling and visual imaging;
- Serious messages interspersed with humour;
- Use of national statistics for credibility.

Conducting a focus group to ascertain consumer views and ideas on the introduction of a video proved beneficial and insightful for both researchers and consumers. Comparison of key findings from both the focus group discussions and the evidence in the literature were consistent. The study was successful in combining consumer focus group findings and best available evidence to prepare a patient education program, thereby contributing substantially to the development of person-centered healthcare.

#### **Acknowledgements and Conflicts of Interest**

We acknowledge the contribution of the Consumer Engagement and Advisory Group. We declare no conflicts of interest.

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### **3.3 Publication Three: Computerised Clinical Decision Support Systems: Rhetoric or Reality?**

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## **Abstract**

### **Objective**

To provide an overview and general description of computerised clinical decision support systems and, in particular, their potential use in venous thromboembolism prevention programs.

### **Target Audience**

This tutorial targets clinicians and decision-makers working within acute care health services who have an interest in the use of computerised clinical decision support systems as a potential tool for improving the overall quality, safety and efficiency of the healthcare delivery system.

### **Scope**

We describe the increasing interest in the use of computerised clinical decision support systems as a potential mechanism for improving care and reducing healthcare costs. We explain their successful use is inter-connected with their integration with other various eHealth technologies, in particular electronic medical records and computerised provider order entry systems. We then contextualise these findings within the Australian healthcare setting. We outline the varying features, benefits, barriers, unintended consequences and possible implementation strategies that can either reduce or enhance the appropriateness and effectiveness of computerised clinical decision support systems. Finally, we consider their application in two study hospital venous thromboembolism prevention programs and highlight the critical success factors. We recommend institutions carefully evaluate the effectiveness and applicability of this type of eHealth technology to their specific setting before proceeding with caution.

### **Key words**

Acute healthcare; Clinical Decision Support Systems; eHealth; Venous thromboembolism

## INTRODUCTION

The main focus of this paper is to provide an overview and general description of computerised Clinical Decision Support Systems (CDSS) and, in particular, their potential use in venous thromboembolism (VTE) prevention programs. There is increasing interest in the use of computerised CDSS as a potential mechanism for improving care and reducing healthcare costs.[1-3] Kawamoto et al.[4] define a computerised CDSS as ‘...any electronic system designed to aid directly in clinical decision making, in which characteristics of individual patients are used to generate patient-specific assessments or recommendations that are then presented to clinicians for consideration’.

The catalyst for the paper was a best practice implementation study on the prevention of VTE undertaken by a multidisciplinary project team in an Australian academic acute care hospital. Key components of an evidence-based VTE program which was developed included individualised patient risk assessment; ordering of appropriate thromboprophylaxis; and the assessment of relevant pharmacological and mechanical contraindications.[5,6] All these components are potentially amenable to standardisation and systemisation through a CDSS. However, the project team encountered a number of difficulties in instituting a CDSS for VTE. This led to a review of the literature on the implementation of CDSS in order to better understand the barriers and enablers to their introduction.

A specific review of the scientific literature was undertaken to ascertain the potential usefulness of computerised CDSS in VTE prevention programs. Results indicated they can be effective in reducing inefficiencies in health[5-13] but their successful use corresponds with the organisation's eHealth technology capability and the specific features built into the system. The many benefits, barriers and unintended consequences to the rise, or not, of computerised CDSS in the Australian public healthcare system is discussed using the VTE program as a case in point.

## **Inefficiencies in the healthcare system**

There is an increased awareness of the gap between clinical practice and the findings of research. Evidence shows that health services frequently fail to optimally use research evidence which leads to inefficiencies, reduced quantity and quality of life for citizens, and lost productivity.[14,15] Studies show that many patients receive inappropriate, unnecessary or potentially harmful care.[16,17] Recent Australian data reported by Runciman et al.[18] from the Care Track study, showed only 57% of recommended care was being provided to patients. Successive Australian government's claim that increasing healthcare costs are unsustainable[15,19,20] and, as such, healthcare reform must become a necessary priority. The key focus of reform, however, has been to slow cost growth by introducing drastic changes, such as compulsory co-payments,[21] cuts in hospital funding, closure of beds and services and retrenchment of front-line clinical staff.[20] Jeffrey Richardson,[22] from the Centre of Health Economics, Monash University argues that Australia spends less on health than most other wealthy countries and has been relatively successful in restraining the growth of health spending.[23] He further argues that, '...irrespective of comparative statistics, health spending in Australia – or public health spending in particular – may be inefficient'.[22] This highlights the important need to improve efficiencies and reduce waste as a key component to slowing healthcare costs.[15,24,25]

## **eHealth in healthcare reform**

eHealth has emerged as the most promising tool for improving the overall quality, safety and efficiency of the healthcare delivery system.[3] Computerised CDSS, in particular, have the potential to help clinicians accomplish many tasks that facilitate compliance with established evidence-based guidelines as well as reduce variations in clinical practice.[7] Dowding [26] claims they are most useful in situations where health professionals need to pull together complex information from a variety of sources. Following a systematic review, Garg et al.[27] identified four categories where computerised CDSS have proven to be useful including diagnostic, disease prevention, disease management and drug dosing and prescribing systems. The VTE prevention project appeared to be a good fit with

the functions of a computerised CDSS. These include an automated reminder/alert to clinicians to perform a VTE risk assessment (disease prevention), and then based on the risk status identification of the need for thromboprophylaxis prescribing (disease management), followed by recommendations for drug, dosage and duration (drug dosing and prescribing). It is claimed that computerised CDSSs do a better job at bringing evidence into practice[28] and this is the central issue identified for improving quality and reducing costs. Their successful use, however, is complex and is influenced by many considerations, most importantly their integration with other eHealth technologies.

### **eHealth technologies for hospital systems**

Various eHealth technologies are available to Australian public hospitals that can be integrated into their existing Health Information Technology (HIT) systems. For many reasons, mainly cost, these are not widely implemented and are not well understood by the average clinician. Black et al.[29] describe the following key eHealth technologies:

1. Electronic Medical Record (EMR) is a longitudinal collection of patient-centric health care information available across providers, care settings, and time. It is a central component of an integrated health information system;
2. Picture Archiving and Communication Systems (PACS) are clinical information systems used for the acquisition, archival, and post-processing distribution of digital images;
3. Systems to support Clinical Decision Making:
  - a. Computerised Provider (or Physician) Order Entry (CPOE) that are typically used by clinicians to enter, modify, review and communicate orders and return results for laboratory tests, radiological images, and referrals (pharmacy);
  - b. ePrescribing refers to clinical information systems that are used by clinicians to enter, modify, review and output or communicate medication prescriptions;
  - c. Computerised Clinical Decision Support Systems (computerised CDSS), when used in the context of eHealth technologies, are clinical information systems that integrate clinical and demographic patient information to provide support for decision making by clinicians.

Integrating all these features into one overarching eHealth information

technology system would be the ideal but multiple financial, clinical, technical, governance and administrative barriers currently prohibit most Australian health care services from being able to implement this highest level of eHealth system. Many hospitals do, however, have specialised clinical information systems that have interoperability and interconnectivity to a centralised data repository, such as a digital medical record.

### **Computerised CDSS and EMR capability**

Of the eHealth technologies listed above, the successful use of CDSSs in healthcare mainly depends on the level of electronic medical record (EMR) capability and this varies considerably in hospitals.[30] HIMSS Analytics[30] developed an EMR 'adoption model' that identifies eight (0-7) stages towards achieving a paperless environment and improving the quality of care through the use of technology, ranging from no ancillary department systems being installed, through to a paperless EMR environment. Computerised CDSS capabilities related to evidence-based medicine can be available between levels 4 to 6. This range may account for the variation in the use of computerised CDSS across health services, as their development is dependent on the individual service's progress along the continuum towards a complete EMR. A 2013 HIMSS report[31] shows that 94.9% of Australian hospitals (n=217) were assessed at stage 2 or below with cost being a major issue. Computerised CDSS are best supported in a full EMR environment. As the 2013 HIMSS report[31] demonstrated, hospitals with more advanced EMRs were more able/likely to achieve substantial quality and safety benefits as CDSS are more easily incorporated into routine clinical workflow.

Currently, the majority of healthcare facilities in Australia are still completely paper-based although most hospitals have introduced specialised clinical information systems that have interoperability and interconnectivity to a centralised data repository, such as a scanned digital medical record. The Victorian Health Department attempted to implement an EMR across the state with the HealthSMART program, but due to financial costs the project was cancelled.[32] South Australia (SA) Health is in the process of implementing the 'Enterprise Patient Administration System (EPAS)'. This system is the foundation

for an EMR in all public hospitals and health care sites within SA. It is anticipated that this will allow for successful integration of computerised CDSS into SA and increase the benefits of the EMR.[33] The introduction of computerised CDSS into healthcare systems is complex and convoluted with varying features, benefits, barriers, unintended consequences and implementation strategies that can either reduce or enhance the appropriateness and effectiveness of a computerised CDSS.

### **Features of computerised CDSS**

Given the potential benefits of CDSS and the range of barriers to full implementation, it is important to understand which key features of CDSS systems best link with system prerequisites to obtain the best functionality in a cost restrained environment. However, computerised CDSS vary greatly in design, function and use. There is much heterogeneity in the reporting of individual studies,[34,35] which are sometimes incompletely described with inconsistent use of terminology.[36] Multiple features can be incorporated into the construction or design of a computerised CDSS[5,7-10,27,35,37,38] and these features are listed in Table 1:

**Table 1. Features of computerised CDSS**

| <b>Features</b>   |
|---|
| <ul style="list-style-type: none"> <li>• Stand-alone or integrated into a CPOE/EMR system</li> <li>• In-house development or commercially available</li> <li>• Knowledge base derived from local expert opinion or evidence-based clinical practice guidelines</li> <li>• Used in different healthcare settings: acute, outpatient or primary care</li> <li>• Clinician- or patient-oriented</li> <li>• Auto data entry via EMR or manual data entry</li> <li>• Passive or active electronic alert or reminder, with or without forcing function</li> <li>• Mandatory or voluntary (opt-out) compliance</li> <li>• Provision of recommendations versus assessment/information only</li> <li>• Critiquing system with feedback at time of patient care or reminder system</li> </ul> |

Computerised CDSS can contain a mixture of features making it difficult to draw conclusions about which individual features impact most on clinical effectiveness. Kawamoto *et al.*,[4] however, identified four independent features of



computerised CDSS that were predictors of improved clinical practice: automatic provision of decision support as part of clinical workflow; provision of recommendations rather than just assessments; provision of decision support at time and location of decision making; and computer based decision making. Many studies confirm an essential success factor for introducing a computerised CDSS is its' seamless integration into user workflows. As Strieff et al.[8] state, 'Evidence suggests technology based change is difficult if not hard-wired into the clinical workflow'. The ability to 'mix and match' various features of a tailored computerised CDSS into a specific situation and setting, according to available finances, needs to be measured against the identified proven benefits.

### **Benefits of computerised CDSS**

Computerised CDSS for use by consumers, patients and health care professionals, have been successfully implemented in a number of healthcare settings.[38] Proven benefits[4,9,11,27] relating to patient safety include reductions in medical errors, provider alerts of abnormal tests and suggested prophylaxis interventions. Better disease-specific outcomes have been identified in the prevention of pneumonia, surgical site infections and new coronary events. Reductions in healthcare costs have also been identified. A systematic review by Chaudry[36] examined the costs and benefits associated with the use of health information technology and its effects on clinical care. Three major effects on quality were identified with increased adherence to guidelines, enhanced surveillance and monitoring, and decreased medication errors. Major efficiency benefits were shown with decreased utilisation of potentially redundant or inappropriate care. Effects on time utilisation, however, showed mixed results and empirical cost data were limited. Despite these clear advantages, uptake and motivation to acquire computerised CDSS remains low[7] with a multitude of potential barriers being cited as reasons for this poor uptake.

### **Barriers to computerised CDSS**

A number of potential barriers to the adoption and implementation of computerised CDSS have been reported.[6,7,9,12,27,28,39] These barriers, listed in Table 2, are significant and can impact both implementation and sustainability of computerised CDSSs.

**Table 2. Potential barriers to the use of computerised CDSS**

| Barriers   |
|--|
| <ul style="list-style-type: none"><li>• Capital investment for purchase and the resources to maintain the computerised CDSS</li><li>• Lack of cultural acceptance of medical informatics technology</li><li>• Failure of healthcare practitioners to use computerised CDSS</li><li>• Poor integration into the clinical workflow</li><li>• Non acceptance of computer recommendations</li><li>• Uncertainty of the benefits of computerised CDSS</li><li>• Upgrade availability</li><li>• Compatibility with legacy applications</li><li>• Concerns around healthcare practitioner dependence on computerised CDSS with eroded capacity for independent decision making</li><li>• Inadequate information technology system resources</li><li>• Recommendations being too general and concerns of adaptability to local needs</li><li>• Alert fatigue</li><li>• Availability of hardware and/or mobile devices to access the computerised CDSS</li><li>• Effectiveness of implementation and education programs</li></ul> |

Significant costs are associated with the introduction of computerised CDSS, along with, as described above, many individual, professional, social, cultural and organisational constraints. To ensure effective and sustainable change management, as required with any knowledge translation initiative, barriers and appropriate interventions to overcome these barriers need to be identified.

### **Unintended consequences of computerised CDSS**

In addition to potential barriers, there are reports[26,39-41] stating that a number of unintended consequences of using computerised CDSS relating to both their *content* and *presentation* can, in fact, lead to errors. These include elimination of human systems checks which may lead to further errors, alert fatigue and workarounds. See Table 3:

**Table 3. Unintended consequences of using computerised CDSS**

| <b>Content-related</b>   |
|--|
| <ul style="list-style-type: none"><li>• Elimination or shifting of human roles where the perceived need for the 'double-checking' of orders is eliminated</li><li>• Difficulty in ensuring the currency of the content can impact when there are changes to coding, billing, standards and updates to order sets or algorithms</li><li>• Wrong or misleading content can lead to inappropriate ordering of supplies, inappropriate alerts, lack of trust in the information delivered and /or data quality problems.</li></ul> |
| <b>Presentation-related</b>  |
| <ul style="list-style-type: none"><li>• Rigidity of the system leading to the use of workarounds or linear order sets that do not mirror the complex reality of ordering</li><li>• The potential for alert fatigue with subsequent ignoring of alerts or, where possible, opting out of the computerised CDSS</li><li>• The potential for the computerised CDSS to be a source of potential error through inaccuracy of auto-complete features or timing of alerts leading to delayed actions</li></ul>                        |

Despite these potential problems, there are a number of benefits to introducing computerised CDSS, including the provision of current research evidence to inform and support clinician decision-making in practice. However, there needs to be a clear rationale for their introduction and systems need to be in place to support implementation and monitor use and any unintended consequences once they have been introduced. Wright *et al.*<sup>40</sup> also identify the critical need for effective clinical and technical governance structures to ensure successful and sustained implementation of computerised CDSS.

### **Evaluating the effectiveness of computerised CDSS**

Chaudry *et al.*[36] reported that quantitative research on the effectiveness of computerised CDSS is limited and where reported has been mostly done by a small number of 'early adopter' academic institutions that have implemented internally adopted systems, in an iterative fashion, over many years and led by academic research champions. They reported that the effectiveness of technologies in practice settings outside of these 'academic research leader' hospitals, where most care is delivered, is less clear. In these other practice settings, internally adopted systems are less feasible and therefore commercially available systems are required and need to be implemented over a much shorter time frame due to logistics and cost constraints. There is not enough financial

data available on whether these are cost effective to adopt. In contrast, a more recent review by Bright et al.[1] reported that both commercially and locally developed computerised CDSS are effective at improving health care processes across many diverse settings. Most systems, however, are heterogeneous and incompletely described with evidence for clinical, workload, and efficiency outcomes sparse. The main focus of this paper, however, is to review the potential use of computerised CDSS in VTE prevention programs and the evidence supporting such a program is discussed further.

### **Computerised CDSS and VTE**

The optimal features of a computerised CDSS for an inpatient VTE prevention program includes a computerised CDSS that is integrated into a Computerised Physician Order Entry (CPOE) and auto-populated from the EMR.[37] A computer automated alert/reminder, built into the routine clinical workflow at the time of admission, would require the assessment of individual patient VTE risk factors and contraindications, with the computerised CDSS derived order set/algorithm providing recommendations for the appropriate prophylaxis regime including drug, dosage, frequency and duration, at the time of prescribing. This gold standard system requires the computerised CDSS to be fully integrated into an EMR and CPOE and is therefore cost prohibitive to the majority of hospitals.[31] The alternative is a paper-based CDSS consisting of a VTE risk assessment form and associated VTE order set outlining recommended prophylaxis regimes based on the individual patient risk stratification. Strieff et al.[8] outlines a number of barriers to paper-based order sets. They are time consuming to locate and complete; are not part of the normal workflow for order entry; are resource intensive in tracking performance given the large patient volume and are visually challenging due to the large number of risks/contraindications and the corresponding variety of prophylaxis options. Although paper-based CDSS have been shown to have some clinical benefit in healthcare, computerised CDSS are deemed to be far superior.[7]

### **Effect of computerised CDSS in VTE programs**

Many studies[5,7-9,11-13,35,37,42] have demonstrated improvements in venous thromboembolism prophylaxis with the use of computerised CDSS and this is a

promising area for implementation. In order to determine the effectiveness of computerised CDSS in VTE prevention programs, however, it is necessary to identify and measure critical endpoint/s. A primary endpoint would be the percentage of risk assessments completed within 24 hours of admission. A secondary endpoint would be the percentage of patients ordered appropriate prophylaxis according to clinical guidelines. A safety-related endpoint would be rate of hospital associated bleeding.[5,6,37] These specific endpoints measure processes and structure of care, not patient outcomes. Difficulties in interpreting outcome measurements for VTE events are widely recognised and further research is needed to elucidate the effects on patient outcomes. Studies need to be large enough for statistical analysis of outcome measures.[5,7,8,11,27] The experiences of two hospitals in using computerised CDSS as an aid in VTE prevention programs are outlined below. The different features of the systems used are outlined.

### **Johns Hopkins Hospital experience**

The Johns Hopkins Hospital (JHH), United States, initially introduced a paper-based VTE order set which was upgraded to a computerised CDSS at the time of introducing a hospital-wide integrated EMR and CPOE system. The computerised CDSS was developed in-house over a long period of time, in an iterative fashion and was led by a team of leading academic champions. On entry into the CPOE, an alert required the clinician to complete a short checklist of risk factors and contraindications. The order set then deployed an evidence-based algorithm to identify the patient risk stratification and provide the recommended appropriate prophylaxis regime. An opt-out system was not accepted but the clinician could choose to ignore recommendations. A retrospective cohort study in adult trauma patients reported improvements to process measurements that included VTE risk assessment within 24 hours; an improvement from a baseline of 3.0% to 97.8%. Ordering of guideline-appropriate prophylaxis improved from a baseline of 66.2% to 84.4%. Outcome measurements improved with a reduction in VTE events from 3% to 1.25% and preventable harm statistics reduced from 1% to 0.17%.[7] The computerised CDSS implemented at JHH is a gold standard system with the key features of an EMR with an automated alert built into the routine clinical workflow that requires individual patient VTE risk assessment with

subsequent generation of recommendations for appropriate prophylaxis at the time of prescribing via the CPOE. Reported improvements to process measurements and patient outcomes were significant. However, a system such as this is out of the reach of most health services.

### **Multicentre Australian hospital experience**

A second example relates to a pilot study undertaken at Geelong Hospital in Australia, involving the in-house development of a stand-alone electronic risk assessment tool (eIVis) as part of a VTE prevention program.[43] The computerised CDSS was fully integrated within the hospital admission process with compliance levels being high. A subsequent multi-centre roll-out of the electronic risk assessment tool was then undertaken but the computerised CDSS was not fully integrated within the hospital's patient admission system, rather it was a separate, user-initiated application. This created a major impediment to its routine use, as clinicians needed to specifically open the electronic risk assessment tool to assess the VTE risk. As a result there was low and variable use of the electronic risk assessment tool between participating hospitals and even between medical, surgical and orthopaedic areas. The risk assessment tool did not form a seamless part of the admission system which compromised the routine use of the electronic risk assessment system. Only 20.5% of patients (22.6% high risk patients) were assessed using the eIVis tool. Researchers reported the implementation of the electronic VTE risk assessment tool and accompanying education activities resulted in improvements in VTE prophylaxis of 5.0% for all patients and 10.7% for high risk patients but no patient outcome measurements were reported.[10] The eIVis computerised CDSS was not able to incorporate, what appears to be the critical success element in the JHH example (and reported in the literature): an EMR with a computerised CDSS built into routine clinical workflows.

These two examples highlight the heterogeneity of individual studies, the necessity for systems to be built into routine clinical workflows and the inconsistency in reporting making it difficult to compare and evaluate the effectiveness and applicability of computerised CDSS in various healthcare settings. Although the effectiveness of computerised CDSS in VTE prevention

programs has been demonstrated but their ongoing success is subject to specific automated features being built into routine clinical workflows as part of an EMR. If these requirements can be met, various active implementation strategies are then needed to facilitate user compliance and cooperation.

### **Implementation strategies for computerised CDSS in VTE programs**

Clinical trials have identified several critical requirements for the successful implementation of CDSS in VTE prevention programs.[5,7-9,44] Multiple, active strategies are required and are listed in Table 4.

**Table 4. Implementation strategies for computerised CDSS in VTE prevention programs**

| <b>Implementation strategy</b>  |
|---|
| <ul style="list-style-type: none"> <li>• System being driven by clinical champions</li> <li>• Employing incentive programs</li> <li>• Being integrated into quality improvement programs (e.g. audit and feedback)</li> <li>• Fostering a cultural shift towards a greater acceptance of medical informatics technology</li> <li>• Hardwiring the computerised CDSS into the daily workflow and coupling with CPOE</li> <li>• Limiting the support to key decisions to avoid alert fatigue</li> <li>• Offering recommendations in addition to assessments</li> <li>• Using alert-based or automatic computerised CDSS rather than on-demand or user-initiated systems</li> <li>• Measuring both clinical outcomes and provider behaviour</li> </ul> |

Most of these implementation strategies form part of the general knowledge translation narrative around the introduction of computerised CDSS in general and can be applied in a broader context. Other less effective strategies include paper-based order sets, continuing education programs, passive dissemination of guidelines, the use of handouts, posters and laminated cards.[6,13] These, however, are often the strategies mostly employed by the majority of hospitals in the absence of costly eHealth technologies and limited resources and they also contribute to the ongoing waste of resources on ineffective and inferior implementation programs.

## CONCLUSION

This paper specifically discusses the use of computerised CDSS in acute care hospitals and their applicability and effectiveness in VTE prevention programs. There is growing interest in the use of eHealth technologies, in particular computerised CDSS, as one methodology in helping to contain rising healthcare costs; bridging the gap between research and practice; and reducing the use of redundant health care. Although computerised CDSS can be stand-alone, most studies demonstrate their ongoing success and sustainability depends on their linkage to an EMR and CPOE where full integration into the routine clinical workflow is achieved. Despite the contribution that computerised CDSS can make to the safety and quality of healthcare, their uptake is small. In Australia, this can be attributed to the slow progression of hospitals along the continuum towards a complete EMR. There is much heterogeneity in the design and features of computerised CDSS and this is reflected in the reporting of individual studies, making it difficult to draw conclusions. Multiple technical, cultural and organisational barriers, unintended consequences and limitations associated with the implementation of computerised CDSS also need to be identified and considered. The lack of evidence of their effect on time utilisation and the limited data on cost are additional and significant barriers. There have been numerous efforts made to improve VTE prophylaxis and systematic reviews indicate that passive methods, such as the dissemination of guidelines, are unlikely to translate into improved practice. Factors that appear to improve VTE prophylaxis are systems that remind clinicians to assess the VTE risk status of patients, and then assist clinicians prescribe the appropriate prophylaxis for the risk classification at the time of decision making. Studies that have used computerised CDSS to improve VTE prophylaxis have reported improvements in both process and outcome measurements but are mostly associated with 'academic research leader' hospitals with in-house developed systems. The majority of healthcare is delivered outside of these institutions where eHealth technology capability is limited and there are significant cost and time constraints. Future direction for computerised CDSS requires further studies on commercial systems for broader application. More information is needed on organisational change, workflow re-design, human factors and project management issues in



order to realise their full benefits. In addition, uniform standards are needed for the reporting of research on the implementation of eHealth technologies and further research is needed on their effect on improving patient outcomes. Computerised CDSS are promoted for their potential to improve the quality of healthcare but the reported complexity, variability, barriers, unintended consequences and costs associated with the introduction of computerised CDSS suggests that institutions need to evaluate the effectiveness and the applicability of this type of eHealth technology before proceeding with caution.

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## **COMPETING INTERESTS**

The authors declare no competing interests.

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## **CHAPTER FOUR: DISCUSSION AND CONCLUSION**

### **4.1 Overview**

Knowledge translation and its emergence as an important aspect of facilitating appropriate, effective and efficient health care and services has been argued in chapter 1. The optimal methods for bridging the gap between research and clinical practice are still in discovery. Provision of robust, synthesised, scientific evidence is not automatically transferred or translated into complex, multi-level, multi-faceted and social health care systems where evidence must be tailored to the individual context. This requires the identification of barriers and the implementation of evidence-based interventions in order to overcome these barriers. In chapter 2, a comparison of three different knowledge translation models was undertaken with the JBI model, using participatory action research methodology, identified as the most comprehensive and appropriate for a best practice implementation study. A summation report of the case study is presented in the first of three publications in chapter 3. Subsequent publications are examples of two major action research cycles that describe the use of computerised clinical decision support systems as an aid to knowledge translation and how a consumer focus group informed the production of a patient education video.

In this final chapter I will provide a summary, analysis and critique of the JBI model and its appropriateness for use as a knowledge translation model in a practical case study on the prevention of VTE in an acute tertiary-referral teaching public hospital. The evaluation and reporting of implementation studies has been identified as a critical component in contributing to the development of the science of knowledge translation and key elements have been incorporated into this report. The framework of this chapter and the critique of the case study is reflective of that presented in chapter one with the application and effectiveness of the JBI model discussed under the same eight common phases of the knowledge translation process. The lessons learnt from undertaking the best practice implementation study will be incorporated within the narrative critique and will be summarised in the provision of a number of recommendations.

The completion of a best practice implementation study on the prevention of VTE provides insight into the complexity of introducing a multi-faceted VTE prevention program. Weiner et al. (2011, p. 9) define complex as, ‘...innovations that require collective, coordinated behaviour change by many organisational members in order to successfully implement them and realise some or all of the anticipated benefits of the innovation use’. The JBI model was used to provide a methodology for getting the best available evidence into clinical practice, to provide leadership and support for evidence-based practice, facilitate knowledge utilisation, ensure intervention fidelity, and to evaluate the effectiveness of the JBI model as a knowledge translation method in the context of the study organisation. The JBI model demonstrates a proven method of how to introduce best available evidence into the clinical setting. The major challenge remains to fully embed the VTE prevention program into routine clinical practice.

#### **4.2 JBI Model**

Whenever any planned change model is used, change agents should consider documenting their experiences with the model so as to advance understanding of how useful the model is and to provide information to others who are attempting a similar project (Graham et al. 2007, p.940).

The ultimate aim of evidence based practice, knowledge translation and indeed the JBI Model for Evidence-Based Health Care (JBI model) is ‘global health’. Chaudoir et al. (2013, p.16) agree stating, ‘...as the nexus between research and practice, the field of implementation science plays a critical role in advancing human health’. Michie et al. (2009, p.1 ) state population (or global) health ‘...can be improved by changing behaviour in those at risk from ill health, in those with a chronic or acute illness, and in health professionals and others who are responsible for delivering effective, evidence-based public health and health care’. For the purposes of this thesis, global health specifically refers to the prevention of VTE in the hospital setting. In the current age of austerity measures and fiscal challenges, the focus of governments, regulatory agencies, policy makers and managers can often be diverted to ensuring efficient and cost effective health care rather than ensuring ongoing focus on health and patient outcomes. The JBI model provides the resources and mechanisms for getting the best available evidence into clinical practice to improve patient outcomes whilst

also considering the feasibility, accessibility, meaningfulness, effectiveness and economic viability (F.A.M.E.E.) of the evidence that is generated for the specific population, culture and setting (Lockwood et al. 2014).

The JBI model has been described and its use justified in chapter 2 of this thesis. It provides a complete 'one-stop-shop' of resources and training that is inclusive of all the phases of a planned action model and the knowledge translation process. In practice, and relative to this case study, the JBI model has shaped the development of a best practice implementation project for the prevention of VTE. The program marries the strength and robustness of the scientific evidence with locally derived clinical solutions implemented in the local setting. Due consideration has been given as to what and how to report the findings of the case study and these are explained below.

### **4.3 Standards for Reporting**

In this chapter I am evaluating and reporting on a best practice implementation case study using the JBI model. Because translational research is a new and unproven discipline, with no 'how-to' manual, it is important to evaluate each attempt at translation as the field takes shape ('To thwart disease, apply now' 2008, p. 823). Likewise, it is important to report and publish research findings in a standard and consistent manner in order to facilitate systematic reviews from heterogeneous studies. Knowledge translation, however, is a new and evolving science where the pathway ahead has not been clearly articulated (Clancy 2009). As Kitson (2008, p. 224) states:

...the growing evidence from knowledge translation activity is demonstrating that single intervention studies and attempts to control multiple contexts are fraught with theoretical and methodological challenges. At its core, the dilemma may be one of philosophy – how to view the world of practice and how to create conceptual frameworks about the range of knowledge needed for practice.

Those studying the implementation of knowledge translation activity have not yet succeeded in establishing an effective model. Consistent and thorough reporting of studies is required to aid this development.

There are numerous standards for reporting on the different approaches to research. These include, for example, the CONSORT statement for reporting on randomised controlled trials (Moher et al. 2001), the QUORUM statement for improving the quality of reports for meta-analyses of randomised controlled trials (Moher et al. 1999), the STARD statement to improve standards for reporting of diagnostic accuracy (Bossuyt et al. 2003), the STROBE statement for strengthening the reporting of observational studies in epidemiology (von Elm et al. 2007), the REMARK guidelines for reporting tumour marker prognostic studies (McShane et al. 2005), the SQUIRE Guidelines for reporting studies of quality improvement interventions (Davidoff et al. 2008) and the Workgroup for Intervention Development and Evaluation Research (WIDER) recommendations (Albrecht et al. 2013). Recent calls question whether it is time for standards for reporting on research about implementation (Rycroft-Malone & Burton 2011). Knowledge translation is a new and emerging science and much is still unknown about what works in practice with many attempts achieving only partial success or lack of success (Rycroft-Malone & Burton 2010). Michie et al. (2009) state it is critical to provide accurate and detailed descriptions of interventions in order to identify the effective core component of individual interventions. These can then be replicated to generate scientific knowledge and allow effective interventions to be subsequently introduced and scaled up.

There are two differing but inter-related foci emerging in relation to the science of knowledge translation. Rycroft-Malone & Burton (2010, p. 121) states there are those ‘...engaged in implementation and knowledge use activity...’ and those ‘...studying the implementation of such activity (i.e. implementation research and evaluation)’. Activities and learning’s of both groups inform the other. The identification of effective implementation strategies, how they work and interact singularly or in combination, across different levels of an organisation and within various contextual environments, requires a comprehensive and standardised approach to describing, reporting and evaluating interventions and knowledge translation processes. Many researchers argue the application of theory, frameworks and/or models to knowledge translation processes, including evaluation and reporting, will help in understanding and making sense of what is going on in the reality of the implementation context (Michie et al. 2009; Rycroft-



Malone & Burton 2011; McWilliam et al. 2009; Estabrooks et al. 2006; Strauss et al. 2009c; Black et al. 2012; Rycroft-Malone 2007; Chaudoir et al. 2013; Brehaut & Eva, 2012). Often evaluation reports do not provide the level of detail required to fully understand the multiple factors at play during intervention implementation. Albrecht et al. (2013, p.1) report that '...interventions are only described in detail 5% to 30% of the time'. Michie et al. (2009, p.3) provide some direction by outlining eight specific characteristics that they believe are essential descriptors of health interventions including:

...the content or elements of the intervention (techniques), characteristics of those delivering the intervention, characteristics of the recipients, characteristics of the setting (e.g., worksite), the mode of delivery (e.g., face-to-face), the intensity (e.g., contact time), the duration (e.g., number sessions over a given period), and adherence to delivery protocols.

Michie et al. (2008, p. 661) report, 'There is increasing recognition that behaviour change interventions should be based on theories of behaviour and behaviour change in their development.' How this can be applied in practice by those engaged in implementation and knowledge use activity is not clear. Michie (2008, p. 67) reasons there are too many potentially relevant theories, as well as a lack of guidance on how to select a theory and apply it to intervention development, further stating that '...mapping theory to techniques...' is required. Nevertheless, the reporting of this practical case study on the prevention of venous thromboembolism will endeavour to incorporate a detailed description of each intervention. A comprehensive analysis report is summarised in the JBI GRiP table that is included in the primary publication. This outlines the identified barriers to implementation, the strategies used to overcome these barriers, the resources required to implement the changes and the outcomes achieved. A detailed narrative critique of each phase of the eight common steps of the knowledge translation process detailed by Graham et al. (2006) and as outlined in chapter one of this thesis, is provided below.

#### **4.4 Case study: VTE prevention**

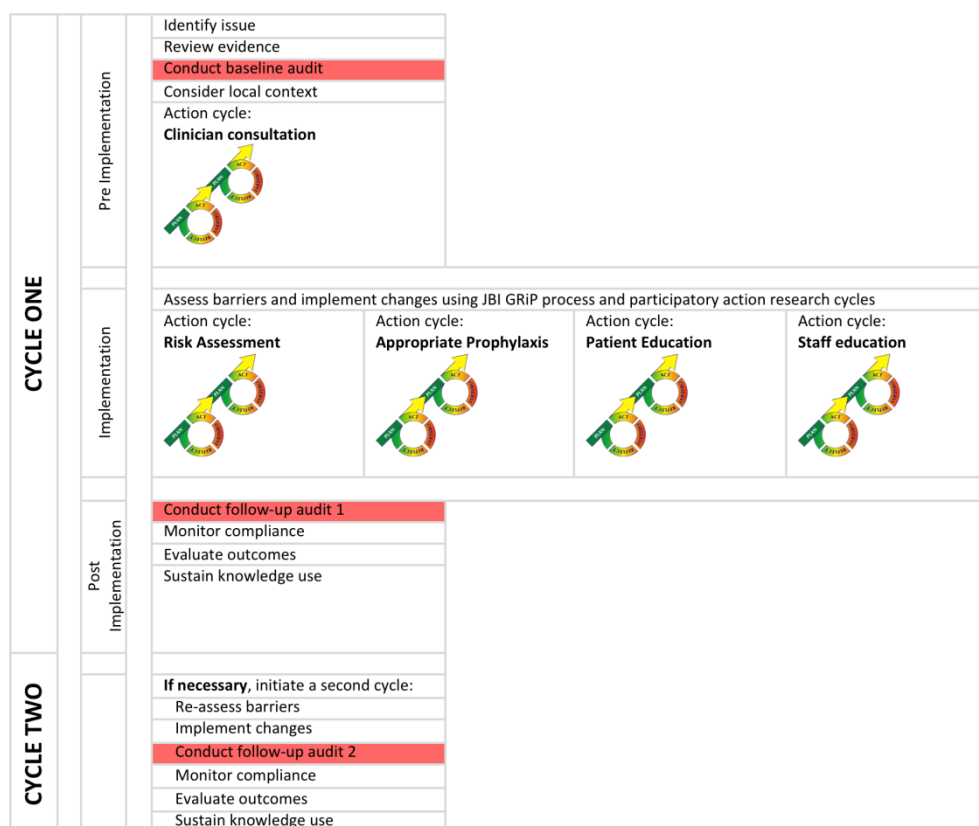
The JBI model for evidence-based health care was used as a template to implement evidence-based practice in the prevention of VTE in an acute tertiary-referral, teaching public hospital. A critical appraisal of the JBI model, its

application in this specific case study and its usefulness as a general approach to implementing the best available evidence into practice is examined below.

It is well recognised and documented that getting evidence from the bench to the bedside is slow and can take years (Morris, 2011). Contributing to this long time frame can be the actual implementation process itself. Saldana (2014, p. 2) states, '...it is generally thought that it takes a site a minimum of two years to complete the implementation process'. The success rate for implementation, however, is low with Drumschroder et al. (2008, p. 2) reporting, '...some estimates indicate that two-thirds of organisations' efforts to implement change fail'. Furthermore, Kislov et al. (2014, p. 2) raises concerns about the sustainability of changes by stating, 'Knowledge mobilisation in health care organisations' is often carried out through relatively short-term projects dependent on limited funding, which raises concerns about the long-term sustainability of implementation and improvement'. It is on this background of uncertainty and with one previous failed attempt to introduce a hospital wide VTE prevention program, that a second project was undertaken at the study hospital. The difference in approach was the adoption and use of the JBI model for implementation.

In an endeavour to critique the JBI model and assess its appropriateness as an implementation methodology, I will analyse and compare its effectiveness in the context of the VTE prevention project, against each of the eight phases identified as common steps in planned action models (Graham et al. 2006). Although the following narrative critique is linear and structured in approach, knowledge translation and indeed, action research cycles, are messy, complex, cross-cutting and do not always occur in a fixed sequence (Figure 4). Multiple action cycles can occur within each major cycle. The following steps have fluid boundaries where knowledge creation and knowledge application can occur at any time within each of the various action research cycles.

**Figure 4. Phases of the JBI Model incorporating the GRiP and Action Research Cycles used in the VTE Prevention Project.**



#### **4.4.1 Identify the problem**

Deep vein thrombosis (DVT) and pulmonary embolism (PE) are known collectively as venous thromboembolism (VTE). These conditions are possible complications in surgical, medical and obstetric patients. A large and comprehensive body of evidence, including hundreds of clinical trials and practice guidelines, showing the effectiveness of thromboprophylaxis has been established for over 50 years. Despite this, a large percentage of patients do not receive optimal thromboprophylaxis and VTE still remains a significant cause of health care associated morbidity and death. VTE prevention is recognised as a top priority in health care around the world. This clinical issue provides a good example of the bedside to practice translational block where rigorous scientific evidence has not been fully implemented into routine clinical practice. Resulting adverse outcomes can include avoidable deaths from pulmonary embolism, increased long term morbidity in the form of post thrombotic syndrome and

increased health care costs from extended length of stay, unplanned readmissions and medications (sometimes lifelong) for the treatment and prevention of VTE. A full report on the VTE prevention best practice implementation study is provided in publication one, chapter three.

Attention to bridging the gap for this clinical issue at the study hospital had been attempted by pharmacy staff previously in 2006 but was unsuccessful with the chairperson stating it was 'too hard'. This clinical problem required hospital-wide, multi-disciplinary and multi-faceted solutions with no extra human or financial resources being available to implement best practice. In addition, the need for change was not recognised by most clinicians who did not see this as a clinical priority. Without measurement and feedback of compliance to clinicians there is no awareness of any gaps in best practice. This phenomenon is referred to as the 'practice versus perception gap' (Black et al. 2012). Although in many cases clinicians prescribed appropriate VTE prophylaxis there did remain a significant gap and, in fact, there was zero compliance with other evidence-based practices, such as individual risk assessment and patient and staff education. In order to address these gaps, an organisational level response was necessary as clinicians cannot comply with local guidelines, document individual patient risk assessment, provide written information to patients about VTE risk on discharge, or participate in staff VTE education programs if resources and guidance do not exist. A pluristic approach using 'push', 'pull' and 'exchange' knowledge translation mechanisms would be required to get the best available evidence into routine clinical practice.

A request from the hospital 'serious incident' panel to implement a hospital wide VTE prevention program provided confirmation this clinical issue was a 'good fit' with the organisation agenda and was an appropriate utilisation of hospital resources, as recommended by Rycroft-Malone et al. (2004). The nominated change agent was a clinical academic with training in knowledge translation and who was familiar with the JBI model. A previous best practice implementation project on the prevention of postoperative delirium in older orthopaedic surgical patients (Sykes 2012) had been undertaken as part of a JBI clinical fellowship. The facilitator role was crucial in driving the project forward over a long period of

time requiring expert knowledge, skills and experience but also commitment to, and passion for, the project (Ploeg et al. 2014).

Kitson (2008, p.225) argues, 'Innovation is most likely to succeed when it involves expert facilitation and key stakeholders'. The formation of a small multidisciplinary team included a mixture of practitioners representing haematology, surgery, anaesthetics, nursing, pharmacy and quality improvement who were considered to have high status within the organisation for their specific level of expertise and knowledge (Kitson et al. 1998; Dogherty et al. 2012). Guidance is provided in the JBI model as to the importance of involving key stakeholders at the beginning of the change process. The group reported through the Chair of the Quality Use of Medicines Anticoagulant Working Group to the Executive Director of Medical Services who was nominated as the project executive sponsor. Both these individuals were considered local opinion leaders that could support the project at a broader hospital-wide executive level. The project facilitator, members of the multidisciplinary team, the local opinion leaders and the local champions who actively engaged in the project along the course of the project all played vital roles in leading the knowledge translation process.

In summary, a serious problem had been identified as an organisational priority that aligned with the JBI aim of improving global health through changing the behaviour in health professionals responsible for delivering effective, evidence-based health care in the prevention of VTE. An appropriate change agent was identified with relevant experience and expertise in knowledge translation who, together with a multidisciplinary team of key stakeholders and local opinion leaders, designed and planned a best practice implementation study using the JBI model that included participatory action research methodology and a proven audit, feedback and re-audit mechanistic process. Review of the evidence was then necessary to measure its rigor, strength and applicability to the local context and its acceptability to local clinical practitioners.

#### **4.4.2 Review the evidence**

As stated previously, the scientific evidence of the effectiveness of prophylaxis in VTE prevention has been well established for decades. There are a multitude of international, national and specialty-specific guidelines that provide guidance for

clinicians, managers and policymakers. Guidelines are regularly updated as new research becomes available but there are limitations in the effectiveness of this synthesised form of evidence. These include the time lag in publishing updated guidelines, the need for adaption into the local context, conflicting recommendations in the evidence derived from the various professional sources, and in relation to VTE prevention guidelines, they are often heavily weighted towards the pharmacological component of prophylaxis regimes. Specifically this includes the choice of drug, dosage, timing and duration of prevention and treatment therapy and where there is little guidance on the entire suite of evidence-based practices, such as individualised risk assessment and education.

The JBI's approach to evidence-based health care is unique. The JBI considers evidence-based health care to be reliant on the evidence, the context in which care is delivered, individual client preference and the professional judgement of the health professional. This philosophy incorporates emerging concepts such as case-based reasoning, clinical wisdom and practice-based evidence or mindlines into the review of the evidence-base. In the frame of VTE prevention, JBI provides a comprehensive package of resources and tools to cater for the differing target audiences such as systematic reviews, evidence summaries, best practice information sheets, evidence-based audit criteria and consumer pamphlets.

The multidisciplinary team reviewed the JBI evidence summary on VTE prevention (Jayasekara 2012) to identify best practice recommendations. The evidence summary for VTE prevention was based on a structured search of the international literature and selected evidence-based health care databases including, an international evidence-based clinical guideline, expert opinion, five Cochrane systematic reviews and a systematic review of 17 studies involving 793 patients. Best practice standards were identified and this information informed the development of audit criteria for the project where current practice was then measured at project baseline against these standards. Evidence-practice gaps were identified from the audit and the project team commenced a major action research cycle of consultation to ensure key stakeholders were informed about the project aims and objectives, the current evidence-base and the results of the baseline audit. The aim of the consultation sessions were to seek clinician

feedback on a number of key issues, gain consensus on the outcomes for the project and most importantly to listen to their specific individual, group and /or departmental experiences and to identify any potential barriers to implementing best practice that may emerge.

As first described by Michael Polanyi in 1958 (cited in Kislov 2014, p.5), 'We can know more than we can tell'. The tacit 'know-how' knowledge that is embedded in practical skills and expertise (Kislov 2014) is a persuasive form of evidence, which exists in a reciprocal relationship with the scientific evidence and therefore needs to be debated and weighed alongside all these other factors. Pablos-Mendez et al. (2006, p. 84) agrees stating there are:

...other valid sources of knowledge: knowledge from practice and the sharing and replication of people's experience. The tacit dimension of knowledge, the social context of knowledge, and the various knowledge-creating mechanisms in place are gaining importance...

Estabrooks et al. (2006, p. 33) further argues that, '....knowledge is produced from negotiations among people as they go about their everyday practice. It is produced over time as groups solve problems'. This proved to be true throughout the consultation sessions with a rich content of two-way knowledge being shared. The project team were better informed and equipped to move the project forward with '...a move from the notion of levels of evidence to a wider appreciation of knowledge in context' (Kitson, 2008, p.225) as well as gaining greater insight into the level of complexity and multi-morbidity that challenges clinicians in relation to using guidelines when caring for individual patients.

A comprehensive body of both explicit and tacit knowledge further shaped the implementation process with subsequent action cycles resulting in negotiation and compromise on some of the evidence for some surgical specialties. These changes to the evidence-base were informed by a combination of additional review of the very latest primary research, the revised grading of evidence for a specific group of surgical procedures and clinician experience / professional craft knowledge (McWilliam et al. 2009) for orthopaedic, neurological and neck surgery. Another example of considering the evidence in deference to local advice and expertise included the parameters for defining 'severe renal impairment' as an indication for reduced dosage of enoxaparin (the drug of

choice for VTE prophylaxis). In response to the consultation session with the nephrology physicians, the registrar undertook a literature review of the topic and in collaboration with the project team, a recommendation to use eGFR (estimated Glomerular Filtration Rate), in preference to CrCl (Creatinine clearance), as the measure for severe renal impairment at the study hospital was agreed. The justification for this related to the equivocal effectiveness of the two measurements and the eGFR measure being more readily available to clinicians in their daily routine practice and therefore more likely to be used for assessment in relation to VTE prescribing. Graham et al. (2006), in their 'knowledge-to-action' framework, describe this process as knowledge creation and is described by McWilliam et al. (2009, p.3) as:

...the tailoring of research-based knowledge through synthesis or aggregation of this evidence, and, subsequently, the creation of tools for clear, concise user-friendly presentation formats designed to influence what potential users do with the evidence.

In summary, robust scientific evidence, even in the synthesised form of clinical practice guidelines, is not sufficient to facilitate diffusion and implementation. The JBI approach to the generation, utilisation and implementation of evidence-based practice is unique and incorporates both explicit and tacit sources of knowledge. This is then packaged to meet the needs of the target audience/s. In order to engage key stakeholders and thereby increase the likelihood of compliance to changes in clinical practice, widespread consultation sessions were undertaken that proved beneficial for knowledge transfer between multiple clinical groups and the project team. This professionally crafted and localised evidence base of knowledge then needed to be implemented into clinical practice with consideration to the local context.

#### **4.4.3 Consider local context**

Context refers to the local environment or setting where the change is proposed to take place and, according to Kitson and colleagues (1998) in the PARHIS framework, includes focus on the local culture, leadership, and measurement. Contextual factors have a potent effect on the implementation of evidence into practice and the need for knowledge to be adapted to the local context is essential (Kitson et al. 1998; Graham et al. 2006; Pearson et al. 2005; WHO



2012). Cummings et al. (2010) report that organisations with more positive contexts are associated with higher reports of research use in practice. The JBI model applies the principles of feasibility, appropriateness, meaningfulness, effectiveness and economic viability when grading their evidence with a recommendation that these should also be taken into consideration when applying the evidence. In practice, this means giving consideration to the local context at the organisation, group and individual levels as well taking into account the social, economic and political context (Grol & Wensing 2004). Barriers, strategies and resources that may apply in one context however, may not necessarily apply in a different context. As stated by Damschroder et al. (2008, p. 2), 'Many interventions found to be effective in health services research studies fail to translate into meaningful patient care outcomes across multiple contexts'. It is necessary to consider the impact of context with each major implementation initiative as well as acknowledging that context is not static, rather it is in a 'constant state of flux' (Rycroft-Malone et al. 2010, p.12), further necessitating the ongoing need for re-evaluation of the context.

As stated in chapter one, there is lack of agreement on what is meant by context and this makes it difficult to frame and describe contextual features in a neat package. For the purposes of this thesis and for reader consistency, I will describe and examine the context of the study organisation, and its implications in the VTE prevention project, within the scope of context outlined in the PARIHS framework (Kitson et al. 1998) that incorporates the sub-headings of culture, leadership and measurement.

### ***VTE study context***

Titler (2010, p.39) states that large organisations '...more readily adopt innovations such as new practices based on evidence'. Specific features relevant to a large organisation include hospital size, urbanicity, division into semiautonomous departments and units that are specialised, with a focus on professional knowledge, with slack resources to channel into new projects, decentralised decision making, and low levels of formalisation. The study hospital is a 483 bed acute care, tertiary referral, teaching, public hospital located in a capital city that incorporates all the listed features of a large organisation. Adler,

Kwon & Singer (cited in Titler 2010, p.39) hypothesise that, '... more structurally complex organisations may be more innovative and hence adopt evidence-based practices relatively early...'. Individual department consultation sessions conducted about the VTE prevention project received a positive response for the introduction of a new hospital-wide protocol that was acknowledged as being long overdue. Decentralised, independent and autonomous decision-making was also evident with requests for professional- and practice-specific knowledge to be incorporated into department-specific VTE prevention guidelines. Organisational support for the project was demonstrated with resources being made available for the change agent to increase participation from part-time to full-time over the course of the project. Additionally, the Anaesthetic Department volunteered 'protected time' of one session per week for increased participation by the anaesthetist on the project team. Adler, Kwon & Singer (cited in Titler 2010, p.39) also hypothesised, however, that, '... less structurally complex organisations may be able to diffuse evidence-based practices more effectively' and this was the case at the study hospital. Diffusion of information at various stages of the VTE prevention project was complex requiring multi-level and multi-disciplinary strategies. Although senior management support for the project was evident, communication systems and systems to support an organisational learning culture were not advanced.

The dominant organisational culture at the study hospital had a significant impact on the ability of staff to bring about changes in practice. The prevailing culture was characterised by constant long term change affecting morale and motivation for change; planning for a major redevelopment of the hospital with 'state-wide significance and status' was underway; a clinical redesign initiative that had a focus on 'doing' and 'busyness' and getting patients through the system created less 'space' for reflection, interaction and collaboration which are important antecedents to evidence-based practice (Rycroft-Malone 2010, p.189); critical and ongoing budget constraints leading to redundancy programs ultimately affecting staffing levels; and a state-wide reform of health services impacting on patients, staff, services and organisational structure. New infrastructure and technical resources, especially in relation to information technologies, such as computerised clinical decision support systems and ePrescribing, were not

available to support proven and effective knowledge translation mechanisms. Individual and group responses to the VTE prevention project were positive but participation was limited by lack of time and competing clinical and educational demands. Fragmentation of care between disciplines and the mobility of the patient population between different wards and care types contributed to a lack of continuity and gaps in care.

Despite this complex, ever-changing and resource-challenged environment, leadership within the organisation was focussed on building and supporting teams who share a common vision and goals, the fostering of innovation at all levels of the organisation and recognition of the imperative for evidence-based practice and improved quality of patient care. The recent con-joint appointment of a Professor of Translation Research, who is also a Fellow of the JBI, has improved the linkage and exchange between researchers and clinicians and enabled the organisation to set a research agenda that will build capacity in knowledge translation across the organisation. There is a strong focus within the JBI on the importance of clinical leadership for the successful implementation of evidence-based practice and the study organisation has demonstrated commitment to a transformational leadership style.

Data for routine and regular measurement and evaluation of care and patient outcomes is not readily available. Processes of imposed audit are 'top down' and are largely driven by regulatory funding data requirements, the clinical indicator program for accreditation purposes, and mandatory auditing of the National Safety and Quality Health Service Standards (Australian Commission on Safety and Quality in Health Care (ACSQHC) 2012). Benchmark reports are not readily available for feedback at the unit level in a timely sequence. There are practical difficulties in capturing and assembling suitable data from data systems which enable clinical staff to routinely review the quality of their current practice.

In summary, some contexts are more conducive to the successful implementation of evidence into practice than others – these include contexts that have transformational leaders, features of learning organisations, empowering work environments (culture), and appropriate monitoring, evaluation, and feedback mechanisms' (Kitson et al. 2008). An assessment of the study hospital context of

'readiness for change' identified a strong and transformational leadership style, existing skills and experience in knowledge translation methodology and features of a large hospital structure where receptiveness to change is more likely. These features, however, were identified on the background of major health service reform, re-design, re-development, redundancies, financial constraints and limited feedback to clinicians on performance. A thorough assessment and analysis of the barriers and enablers identified in the context of the environment can identify modifiable and non-modifiable barriers and provide guidance on the feasibility, accessibility, meaningfulness, effectiveness and economic viability of proposed change interventions, as recommended by the JBI.

#### **4.4.4 Assess barriers**

Many barriers exist that limit clinician uptake and use of new knowledge. To develop a successful strategy for change, there is a need to understand the types of barriers faced in health care and then consider which barriers and levers may be relevant to a particular problem in a particular context. Following careful consideration, it is then possible to develop a tailored approach to overcome modifiable barriers and encourage changes in behaviour and ultimately implement guidance (NICE 2007). The identification of barriers in the knowledge translation process is a key component of the JBI model. Barriers are identified and documented as part of the GRiP process (Getting Research into Practice; a guided method of situational analysis built into PACES).

The GRiP process begins once the results of the baseline audit have been entered into the PACES. The project team identify reasons why practice may have fallen short of the standard and this information is used to develop a plan for practice improvement in the clinical area. The GRiP module is aimed at establishing inter-professional processes within teams to examine barriers to the utilisation of evidence to support best practice and to assist in developing implementation programs to overcome these barriers. As such, it is beneficial to include representation of key stakeholder groups in the situational analysis approach embedded in GRiP. The GRiP analysis begins with the identification or diagnosis of the issues that the project team feel have contributed to the current level of compliance for the audit criteria. This includes the identification of actual

and/or potential barriers to achieving compliance, moves through the identification of action or actions that might address the barriers and incorporates the resource considerations associated with each action. There is no limit to the number of actions that can be added, although giving consideration to what is available and what is achievable will assist in the identification of actions that can be realistically incorporated in the project. This process of identifying barriers, creating actions and allocating resources is a form of situational analysis (JBI PACES User Guide V2 2009). The GRiP table outlining the barriers, actions, resources and outcomes identified for the VTE prevention project is included in publication one, chapter three.

There are multiple barriers that can be encountered at the individual, group or organisational levels when attempting to improve clinical practice. An analysis of barriers and enablers can assist in the planning of implementation studies and help to decide where to focus efforts and resources. As identified by the National Institute of Clinical Studies (NICS) 'Barriers and Enablers' fact sheet (2006a), 'While change strategies may need to be multidimensional or multisectorial, a comprehensive approach that attempts to address all barriers in all sectors and in all settings is usually not feasible or affordable'. Various techniques or methods can be used to examine barriers and these are listed in chapter one. The techniques used to identify barriers specific to the VTE prevention project included brainstorming, case studies, key informants, focus groups, surveys and direct observation. As a result of the information gathered, the following potential barriers were identified:

- ☐ Resistance to change from clinicians;
- ☐ 'Practice versus perception gap';
- ☐ Lack of awareness of some of the evidence;
- ☐ Dispute of some of the evidence;
- ☐ Lack of localised hospital guidelines;
- ☐ Lack of risk assessment tools;
- ☐ Inconsistency in prescribing appropriate VTE prophylaxis;
- ☐ Inconsistency in applying mechanical prophylaxis;
- ☐ Practice culture driven by individual clinician attitudes, belief and practices;
- ☐ Fragmentation of care;
- ☐ Lack of patient education and resources;

- ☐ Lack of formal staff education program;
- ☐ Lack of electronic reminder system and clinical decision support system;
- ☐ Lack of process and outcome measurement and feedback;
- ☐ Absence of available evidence-based VTE resources.

Enablers were also identified and these include:

- ☐ Existing organisational JBI membership;
- ☐ JBI clinical fellowship training;
- ☐ Pre-existing JBI best practice implementation pilot study;
- ☐ Executive leadership and support for knowledge translation activities and VTE prevention;
- ☐ Clinician agreement on need for local practice guidelines;
- ☐ Existing high background levels of appropriate VTE prophylaxis prescribing.

In summary, the identification of barriers and enablers is the first step in undertaking a situational analysis of an evidence-practice gap. Various techniques exist that can be used to help identify barriers to evidence-based practice and the VTE prevention project team used a mixture of techniques appropriate to the study context and the identified clinical issue. Barriers can occur across different levels of the health care service and may need to be re-assessed at different stages throughout the knowledge translation process. Not all barriers are modifiable and this needs to be considered when selecting appropriate actions to address a specific barrier. The JBI model, that includes a GRiP situational analysis, provides a structured process for identifying barriers to change and the relevant actions and resources that are needed to address the barriers. At the study hospital, many of the barriers to evidence-based practice in the prevention of VTE were identified at the organisational level. Despite this clinical issue being identified as a 'high area' for patient safety by the NHMRC (National Health & Medical Research Council (NHMRC) 2009) and serious adverse events having occurred on several occasions, there was no formal hospital wide approach, unclear roles and responsibilities, and limited guidance and resources available to ensure best practice was being followed. VTE prevention standards were determined by senior clinicians who are the key enablers for practice change. This approach often included the use of undocumented specialty-specific 'standard practice regimes' rather than an

individual patient approach, as per evidence-based practice standards. This accorded variability in practice between specialties and even between individual clinicians. In addition, there was no formal or systematic approach to the assessment of individual patient VTE risk factors and contraindications. There were unclear indications for, and documentation of, the use of mechanical devices. There was no formal education program. Patients did not receive education on VTE despite the fact that patient knowledge of the signs and symptoms of pulmonary embolism is critical given that it is a life-threatening complication that often occurs after discharge (Le Sage et al. 2008). The next step in the JBI GRiP process is the identification of actions or interventions and associated resources needed, to overcome the barriers.

#### ***4.4.5 Implement changes***

This phase of the knowledge translation process is about planning and executing interventions to facilitate and promote awareness and implementation of the evidence. Most approaches to changing clinical practice are more often based on beliefs than on scientific evidence. There is consensus amongst researchers that evidence based medicine should be complemented by evidence based implementation (Grol 1997; Grimshaw et al. 2004, Eccles et al. 2005). It involves selecting and tailoring interventions to the identified barriers and audiences. To date, many organisational responses to poor implementation have failed to achieve optimal care despite considerable investments. Guidance on which interventions work best, in what combination, and in which context, remains unclear.

Grimshaw and colleagues (2012) summarise the results of the Cochrane Effective Practice and Organisation of Care (EPOC) group systematic reviews on professional behaviour change strategies. These are discussed below with consideration to implementation strategies used in the VTE prevention project and the JBI GRiP process. As mentioned earlier in this chapter, a JBI GRiP table outlining the specific barriers, actions, resources and outcomes associated with the VTE prevention project is included in the primary publication in chapter three.

*Printed education materials* include the 'distribution of published or printed recommendations for clinical care, including clinical practice guidelines, audio-visual materials and electronic publications' (EPOC cited in Grimshaw et al. 2012, p.5). A number of barriers were addressed in the VTE project through the production of printed educational materials, in particular the development of a hospital-wide protocol; standard, antenatal and postnatal risk assessment tools; eight department-specific practice guidelines; a staff eLearning module; posters; fliers; pamphlets and email communication. Samples of two printed educational materials, including the standard VTE risk assessment form and the VTE practice guideline for surgical services, are shown in appendices 3 & 4. These strategies are considered generally ineffective in changing professional behaviour (Grimshaw et al. 2012; Richens et al. 2004; LaRocca et al. 2012) but are, nevertheless, essential for documenting standardised clinical data, defining, establishing and creating awareness to the best available evidence, clarifying the roles and responsibilities of key staff and medical specialties, and they facilitate compliance with regulatory and accreditation documentation requirements.

*Educational meetings* are defined as the '...participation of health care providers in conferences, lectures, workshops or traineeships' (EPOC cited in Grimshaw et al. 2012, p.7) A multitude of educational meetings were conducted over the course of the project by members of the project team between multiple disciplines. These included didactic style meetings (e.g. lectures, grand rounds, ward in-services), one-on-one information sessions, and interactive consultation group sessions with 23/27 departments within the study organisation. The consultation sessions were conducted to introduce the project team, inform clinicians about the VTE prevention project and JBI methodology, feedback the results of the baseline audit and highlight the evidence-practice gap, provide opportunity to discuss the latest VTE evidence and its relevancy to their specialty/discipline and to receive feedback on any perceived barriers and enablers. A 1-2 page summary of the discussions and recommendations were provided to the departments and as a method of reminder and re-enforcement. Although this process was extremely lengthy (3-4 months), it proved successful and stimulated ongoing interaction and negotiation with some specialties. Consensus and endorsement for the hospital protocol, VTE risk assessment tools



and individual department practice guidelines was ultimately achieved. A similar process was undertaken within the nursing and pharmacy professional communication structures with less feedback and interest received from nursing colleagues. This was possibly due to the perception that VTE prevention mainly concerns physicians and pharmacists and therefore is not high on their agendas.

*Educational outreach*, also referred to as ‘academic detailing’ is defined as ‘...use of a trained person who meets with providers in their practice settings to give information with the intent of changing the providers’ practice’ (EPOC cited in Grimshaw et al. 2012, p.7). This type of intervention has been used across a wide range of health care settings and mainly targets prescribing behaviours. The project team did not deem this particular intervention appropriate to the study context.

*Local opinion leaders* are the ‘use of providers nominated by their colleagues as educationally influential’ (EPOC cited in Grimshaw et al. 2012, p.7). Members of the VTE prevention project team, or the change champions (Titler 2010), were respected for their high status within the organisation and for their specific level of expertise and knowledge. These qualities were extremely helpful in driving the project forward, circulating information, and educating and influencing peers on the new guidelines and changes to clinical practice. Opinion leadership, however, is more associated with the ability to informally influence other individuals’ attitudes and behavior through not just technical competence, but through their ability to facilitate flow of new information, their social accessibility, and their well-developed interpersonal skills (Bywood et al. 2009; Titler 2010). The project opinion leaders, as nominated by the project team, were effective at the executive and organizational level in promoting the use of evidence-based practices and ensuring ongoing support for the project in regard to necessary material and human resources. It also became evident throughout the departmental consultation sessions that various individuals at the ‘practice group’ level were identified by their peers as opinion leaders in regard to this particular clinical problem. Involvement of hospital stakeholders and key opinion leaders in local VTE prevention guideline development was achieved but this level of involvement and influence did not flow through into the implementation phase.

Key stakeholders in the nursing profession were informed about the project but consultation with this group was initially a secondary priority in order to focus on the development of new risk assessment tools and individual department practice guidelines for appropriate prophylaxis. It is clear that the Nurse Unit Manager (NUM) role is a powerful change agent and indeed an influential opinion leader at the ward/unit management and clinical level. The NUM role is very busy and intense with multiple competing demands and priorities. An externally driven change in practice must 'grab' the attention of the NUM and become a priority above other competing priorities. If this can occur, the likelihood of success in implementing changes at the ward/unit level is greater. This belief is based on implicit and tacit 'I just know it' type knowledge that is also supported in the knowledge translation literature (Kislov 2014). NUM leadership is critical in helping to change individual behaviours, such as the provision of VTE patient education, setting ward/unit standards in relation to VTE evidence-based practices, and ensuring important administrative functions, such as risk assessment forms and order sets being included in admission packages. The impact of the NUM role cannot be underestimated. A planned second knowledge translation cycle to improve the uptake of evidence will consider how to further enhance and utilise the role of local opinion leaders at the study hospital as, '...few successful projects to implement innovations in health care organisations have managed without the input of identifiable opinion leaders' (Titler 2010).

*Audit and feedback* includes '...any summary of clinical performance of health care over a specified period of time' that is aimed at changing professional behaviour (EPOC cited in Grimshaw et al. 2012, p.7). Audit and feedback is a key element of the JBI evidence utilisation component of the model. Pearson et al. (2005, p. 214) state that, 'Any systematic approach to changing professional practice should include plans to monitor and evaluate, and to maintain and reinforce any change', and, '...of specific strategies found to be moderately effective, audit and feedback appear to be the most promising'. This is supported in a Cochrane systematic review that also identified that larger effects were seen if baseline compliance was low, the source was a supervisor or colleague, it was provided more than once, it was delivered in both verbal and written formats, it included both explicit targets and an action plan (Ivers et al. 2012). VTE

associated process and outcome measurements are not routinely collected or reported at the study hospital. Feedback of the project baseline audit results to clinicians and senior nursing staff, at 'medical departmental' and 'nursing communication group' consultation sessions, afforded the opportunity to review the study hospital performance against the four evidence-base practice audit criteria. Interest and discussion was stimulated with some 'practice versus perception' gaps identified. The project team presented a plan for implementation to address the evidence-practice gaps, including the intention to conduct a follow-up audit. In reality, the implementation of the project was a long process and the time between the before and after audits was 2.5 years. Saldana (2014, p. 2) states, 'it is generally thought that it takes a site a minimum of two years to complete the implementation process...' and '...that achievement is strongly influenced by the success of the implementation methods'. NICE (2007) also report that it can take up to three years for clinical practice guidelines to be fully implemented. Frequent and regular feedback of audit results is considered to have a greater impact in changing clinical practice (Almatar et al. 2015) and so in a second knowledge translation cycle follow-up audit, the VTE prevention project team will plan small monthly audits of VTE risk assessment compliance for feedback to department VTE clinician leads (subject to acceptance of a recent business plan and resources being available).

*Reminders and computerised decision support.* Reminders are '...patient or encounter specific information, provided verbally, on paper or on a computer screen, which is designed or intended to prompt a health professional to recall information' (EPOC cited in Grimshaw et al. 2012, p.8). They remind clinicians to perform or avoid some action to aid individual patient care. Computerised decision support encompasses a variety of tools to enhance decision-making in the clinical workflow. The optimal features of a computerised clinical decision support system (CDSS) for an inpatient VTE prevention program includes a CDSS that is integrated into a computerised provider/physician order entry (CPOE) and auto-populated from the electronic medical record (EMR). A computer automated alert/reminder, built into the routine clinical work flow at the time of admission, has a 'forcing' function that requires the assessment of individual patient VTE risk factors and contraindications, with the CDSS derived

order set/algorithm providing recommendations for an appropriate prophylaxis regime including drug, dosage, frequency and duration, at the time of prescribing. This gold standard system requires the CDSS to be fully integrated into an EMR and CPOE. This technology has been shown to be effective in improving compliance to evidence-based guidelines as well as reducing rates of VTE (Haut et al. 2012). Clinicians at the study hospital were very supportive of using this type of new technology and thought ‘...it was the only way to go...’ but were emphatic it must be built into their routine clinical workflow. The study hospital, however, has not progressed enough along the continuum towards a complete EMR to be able to utilise computerised CDSS capabilities. Subsequently, the project team needed to implement an alternative paper-based CDSS consisting of a VTE risk assessment form and associated VTE order set (individual department VTE practice guidelines). Strieff et al. (2012) outline a number of barriers to using paper-based order sets in that they are time consuming to locate and complete, do not form part of the normal workflow for order entry, are resource intensive in tracking performance, are visually challenging due to the large number of risks/contraindications and associated prophylaxis options, and are often labelled as being too general. Each of these barriers has been identified with the use of a paper-based CDSS at the study hospital. Haut and colleagues (2012) state that paper-based CDSSs have been shown to have some clinical benefit in health care, but that computerised CDSS are deemed to be far superior. A third publication in chapter three provides further details on how computerised CDSS may, or may not, be effectively used in health care.

*Tailored interventions* are defined as ‘...strategies to improve professional practice that are planned taking account of prospectively identified barriers to change’ (EPOC cited in Grimshaw et al. 2012, p.8). EPOC further classifies barriers into nine categories (information management, clinical uncertainty, sense of competence, perceptions of liability, patient expectations, standards of practice, financial disincentives, administrative constraints and other) (EPOC cited in Grimshaw et al. 2012, p.8). Black et al. (2012) deem interventions that are tailored to address identified barriers as being more likely to improve professional practice and this seems to be a logical and common sense approach. Tailoring interventions to specific barriers is a key and essential

element that forms the basis of the GRiP analysis and implementation plan in the JBI model. As such, the VTE prevention project implementation strategy tailored interventions to specific barriers.

*Multifaceted interventions* are defined as ‘...any intervention including two or more components’ (EPOC cited in Grimshaw et al. 2012, p.8) that are usually targeted at different barriers in the system. Most of the literature suggests multifaceted interventions are more effective than single-component interventions (Boaz et al. 2011; Bero et al. 1998; Grimshaw et al. 2001) but an overview of systematic review conducted by Squires et al. (2014b) found no compelling evidence that multifaceted interventions are more effective for changing health care professional’s behaviours. This is not to suggest that multifaceted interventions are not useful, but where appropriate, a single intervention tailored to overcome a specific barrier may be also be effective and possibly less complicated and costly to implement. During the course of the JBI GRiP barrier and enabler assessment, planning tailored and multifaceted interventions appeared to be a logical next step. These included printed and electronic educational materials, didactic and interactive education and consultation meetings (collaboration and teamwork), use of opinion leaders, paper-based clinical decision support and audit and feedback.

*Patient mediated interventions* are defined by Bero et al. (1998) as ‘...any intervention aimed at changing the performance of health care providers for which specific information was sought from or given to patients’. They aim to actively engage patients to improve their knowledge, experience, service use, health behaviour, and health status. Patient education and information improve knowledge. Other outcomes improve with more specific and personalised information and added professional or other support. The JBI model of evidence-based health care considers ‘client preference’ a key element of evidence generated. It is essential to a patient-centered model of care where more responsibility is placed on patients to participate in health care decisions and to undertake ‘self-care’ behaviours. There is also, however, a corresponding onus on health care services to provide patients, families, carers and consumers with effective and quality health information but as Greenhalgh et al. (2014, p.5) states:

Despite lip service to shared decision making, patients can be left confused and even tyrannised when their clinical management is inappropriately driven by algorithmic protocols, top-down directives and population targets.

Findings from the consumer focus group clearly showed there is an expectation and desire that VTE prevention information is provided to patients and their families/caregivers, especially in hospital. An evidence-based patient information pamphlet and an educational video were planned as interventions to improve knowledge. Despite the pamphlet being available for direct download and printing via a desktop icon, no change in practice was observed and this was attributed to a culture where VTE prevention information is not usual care. In addition, there were significant delays in accessing funding, hospital approval processes and production of the patient education video and this was not available for viewing at the time of the follow-up audit. Findings from a consumer focus group conducted to inform the production of a patient education program are described in more detail in publication two, chapter three.

In summary, the GRiP component of the JBI model involves tailoring interventions to overcome identified barrier/s, with consideration to the resource implications for each strategy. Theory use and development is presented by researchers as a promising approach to better understanding the 'black box' of implementation (Rycroft-Malone 2007, p. S78) but evidence on the feasibility, appropriateness, meaningfulness, effectiveness and economic viability (F.A.M.E.E) for various interventions is still evolving. The JBI GRiP process allows flexibility in determining which interventions may be used to overcome which barriers with the VTE prevention project team using multiple action research cycles of 'plan, do, check, act' to shape and inform implementation strategies over the course of the project. The use of multifaceted interventions was appropriate to address a 'complex' and multifaceted clinical issue such as VTE prevention. The development and use of various printed educational materials did not in themselves effect change, but they were an essential component to raise awareness to VTE prevention evidence-based practice and required clinical and documentation standards. Interactive education and consultation meetings proved highly effective in engaging local opinion leaders in the development of local guidelines and risk assessment tools, as well as their

endorsement of the project. The NUM role as a powerful change agent and local opinion leader can be instrumental in facilitating evidence-based practice in both patient and nursing staff VTE education programs. The evidence utilisation component of the JBI model uses audit and feedback as the basic method for monitoring and evaluating compliance with evidence-based audit criteria. The reporting of baseline audit results to clinicians at consultation meetings proved effective but the time lag between the pre and post audits was long. A statistically significant and effective strategy reported by another research group (Almatar et al. 2015) at the study hospital involved small monthly audits (n=10) with feedback to key clinicians. This is a potential future strategy that could be used in improving compliance with individual patient VTE risk assessment on admission and will form part of a second cycle of implementation. The use of computerised CDSS and electronic reminders as a component of an EMR is a proven effective strategy in VTE prevention programs. The key element is their seamless incorporation into the admission process and point-of-care decision-making. The study hospital does not currently have the EMR capabilities to utilise computerised CDSSs and the development of a paper-based CDSS was therefore necessary. The provision of patient education materials as an intervention to improve knowledge is essential to a patient-centred model of care and shared decision-making but despite resources being available, no changes in practice were measured. A second action research cycle is required to embed VTE risk assessment into routine admission processes. On completion of the GRIP implementation strategy it is necessary to monitor its compliance, and this forms the next step in the knowledge translation process.

#### ***4.4.6 Monitor compliance***

This phase of the knowledge translation process is about measuring changes in practice and compliance with best practice recommendations, often referred to as process or performance measurements (Sudsawad 2007). They are used to assess intervention fidelity (the degree to which interventions are standardised) and evaluate the quality of an embedded process (Rycroft-Malone & Burton 2011), and whether interventions have been sufficient to bring about the desired change or whether more of the same or new interventions are required.

On completion of the implementation stage, a follow-up audit was conducted using the same data collection methodology, baseline audit criteria, and sample sizes. Audit data were entered into the JBI on-line PACES program to enable the generation of a comparative baseline and follow-up audit compliance graph. Refer to graph 1 in publication one, chapter three. The clinical activities database developed for the PACES program acts as a metric that is simple and easy to use and where JBI members can track clinical performance over time.

Multi-faceted knowledge translation strategies to implement best practice in the prevention of VTE at the study hospital led to changes in knowledge but only minimal changes in practice. This was demonstrated by an increase in awareness to the best available evidence through collaboration and teamwork on the development of consensus clinical practice guidelines, tools and pathways. Follow-up audit results, however, showed no change in the provision of patient education at discharge (0%); minimal compliance (8%) in documented individual patient VTE risk assessment on admission; moderate improvement in staff being educated about VTE prevention (57%); but there were small and important improvements in high-risk patients receiving appropriate VTE prophylaxis – this was on an existing background of high rates of compliance (i.e. baseline and follow-up rates for high risk medical patients: 78% to 81%, and high risk surgical patients: 71% to 83%). A Cochrane systematic review of audit and feedback (Ivers et al. 2012) confirm it is difficult to achieve significant improvement with an existing background of high rates of compliance.

As part of the JBI knowledge translation process, a feedback report containing an analysis of audit results and a plan of action should be provided to all key stakeholders. A recommendation to undertake a second VTE prevention cycle was made to enable reassessment of new barriers and implement appropriate interventions (e.g. conduct 'real time' monthly VTE risk assessment compliance audits with feedback to VTE clinician leads, as per Almatar et al. 2015), and also to enable existing interventions to be fully implemented and re-audited (e.g. completion of the patient education video for patients to view on the hospital TV education network). The JBI PACES program permits the entry of multiple audit cycles if required and this recognises the challenges faced with getting research



into practice in the complex and real world of clinical practice - also described by Schoen in 1984 (cited in Rycroft-Malone 2012, p. 1) as the '...swampy lowlands of practice'.

In summary, process or performance measurements enable a critical assessment of the degree of practice change in compliance with the evidence-based audit criteria. As demonstrated in the VTE prevention project results, although improvements in VTE prevention knowledge were achieved, this did not lead to significant changes in practice, particularly on the background of high compliance rates in relation to VTE prophylaxis rates. There were multiple reasons contributing to the results and a second cycle of implementation is recommended. Monitoring compliance is a key element in the evidence utilisation component of the JBI model and is well supported by the on-line PACES program. Measurements in process/performance outcomes, however, differ to measurements in patient outcomes, and this is the next topic of discussion.

#### **4.4.7 Evaluate outcomes**

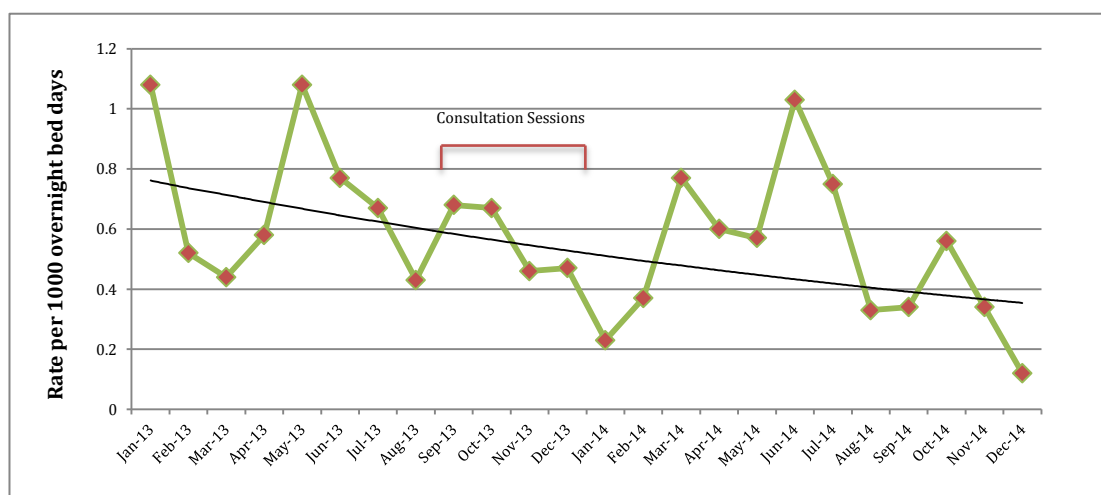
Evaluating outcomes determines the impact of using the evidence and whether it actually makes a difference to patient's health, practitioner or systems outcomes. A famous example for using outcome data to measure impact and persuade people of the need to change was demonstrated by Florence Nightingale in the mid-1800s. She used hospital mortality statistics to convince those in power of the need for change in improving sanitary conditions in military hospitals (Cohen cited in Duckett & Breadon 2014, p. 26).

Measuring outcomes in today's health care system is much more complicated. Outcome measures are harder to collect, more costly and the least used (Agency for Health care Research and Quality (AHRQ) 2014b). They require careful consideration of various factors as to their validity and usefulness, including the need for sufficient sample size for risk adjustment, the appropriate timing for measuring the outcome, and clarity around the target audience (Agency for Health care Research and Quality (AHRQ) 2014b). In addition, there are potential pitfalls in reporting rates of VTE as a quality and patient outcome. Not all cases of VTE can be prevented due to the risks associated with using anticoagulants in some patients. In addition, even these medications are not 100% effective at

preventing all blood clots. Newer definitions of preventable harm that link an adverse event to a lapse in best practice is being considered. This definition of preventable harm places VTE in patients not receiving prophylaxis in the numerator and all patients in the denominator, giving a proportion with 'preventable harm', where a goal of zero is achievable (Haut et al. 2012). There are many nuances to consider when evaluating outcomes.

The JBI PACES on-line program provides the ability to collect, store and report process measurement audit data. The JBI Patient Outcomes on-line (JBI POOL) program is an on-line prevalence database, which can be used as a stand-alone database, or in conjunction with JBI PACES (Practical Application of Clinical Evidence System) and has been designed for collection and storage of patient outcome prevalence data. Prevalence is defined as the total number of an event or disease (such as falls or skin tears) in a given population at a specific time. In terms of the VTE prevention project, the collection of prevalence data is not valid due to the infrequency of occurrence. Over a two-year period of the project, hospital acquired VTE incidence outcome data were collected and stored in a Microsoft Excel (2007) spreadsheet. Results are shown in figure 5. A slight downward trend was observed over the data collection period. Denominator data were sourced from monthly clinical coding reports but there was a time lag in receiving reports of between 1-2 months. Numerator data were obtained through review of patient digital medical records (DMR) and medical imaging reports. Collection of data was labour intensive and feedback of reports was untimely, but it was nevertheless thought to be an essential patient outcome measure to feedback to clinicians based on requests received during the consultation sessions. These outcome evaluation reports may have been more useful and had more impact if reported back to clinicians more frequently and included service-specific and patient-specific information for department level review, if desired.

**Figure 5. Hospital-acquired VTE rate per 1000 Overnight Bed Days - January 2013 to December 2014.**



In summary, evaluating outcomes is more costly, resource intensive and complicated than measuring process performance. If done in a timely manner, and according to the relevant practice standards and definitions, they can help in convincing clinicians that compliance with evidence-based practices can have a positive impact on their patients. The evidence utilisation component of the JBI model recognises the usefulness of evaluating patient outcomes and prevalence data can be entered into the JBI POOL program but this method is not applicable to all clinical issues and all circumstances.

#### **4.4.8 Sustain knowledge use**

The final phase of the knowledge translation process involves sustaining the efforts of practice change in health care organisations. This is needed to not only ensure that patients receive the best possible care but also to ensure that investments made in knowledge translation activities are not wasted (Virani et al. 2009). Sustainability of new clinical practices is a complex construct and presents a significant challenge to practitioners, researchers and organisations but Novotna et al. (2012, p.7) state there is imperative for:

...new ideas and knowledge to become transformed into routinely used organisational practices...their institutionalisation should be an ultimate goal of knowledge translation strategies as it represents their incorporation into organisational structures and integration into the regulative, professional, and cultural-cognitive functions of organisations.

The health care environment is always changing. There are staff movements, changes in services and organisational priorities shift (NICE 2007). When undertaking any change management process, it is important to plan for how change will be sustained in the long term. The sustainability phase should set in motion a feedback loop that cycles through the action phases (Graham et al. 2006; Ploeg et al. 2014), that reassesses barriers to sustainability, tailors interventions to existing or new barriers, implements changes, monitors compliance and evaluates the impact of initial changes and sustained changes. Ongoing cycles of the GRiP process and subsequent follow-up audits, whether for the purposes of implementation, re-implementation or assessment of sustainability, can be entered into the JBI PACES program creating a repository of each iteration.

A specific definition of sustainability in a knowledge translation framework includes ‘...an intervention being in place more than a year after implementation or after the research or project funding period is complete’ (Tricco et al. 2013; Wiltsey Stirman et al. 2012). In these terms, the VTE prevention project has not reached the stage for assessing sustainability as not all interventions have been fully implemented and evaluated, and the completion of the project funding period is less than 12 months.

Kislov et al. (2014) argue that change management has often taken the shape of a short-term, low-level, resource limited, ‘project status’, where changes in practice may initially be successful but are not, or only partially, sustained once the project is finished. The VTE prevention study fits into the short-term ‘project status’ category where a comprehensive program, including the establishment of clinical practice guidelines and associated tools and resources, have been established (Table 1) and a number of ‘boxes’ can be ticked for the purposes of accreditation and regulatory requirements. As reported earlier, knowledge and awareness of the program and the best available evidence for VTE prevention has been achieved but changes in practice have been varied. The ongoing commitment of resources, mainly time, is required by hospital management to fully implement all interventions through a second action cycle.

**Table 1. Summary of VTE Prevention Program Outputs**

|  | Pre VTE Project | 2012-2014 VTE Project   | Sustainability |
|--|-----------------|---|----------------|
| <b>Governance</b>                          | X               | VTE Project team  | QUM* Committee |
| <b>RHH Protocol</b>                        | X               | ✓   | Review 2 years |
| <b>Standard Adult Risk Assessment Tool</b> | X               | ✓   | Review 2 years |
| <b>Antenatal Risk Assessment Tool</b>      | X               | ✓   | Review 2 years |
| <b>Postnatal Risk Assessment Tool</b>      | X               | ✓   | Review 2 years |
| <b>Prophylaxis recommendations</b>         | X               | ✓   | Review 2 years |
| <b>Patient education brochure</b>          | X               | ✓   | ?              |
| <b>Patient education video</b>             | X               | ✓   | ?              |
| <b>Staff education</b>                     | X               | ✓   | ?              |
| <b>Metrics</b>                             | X               | % Hospital acquired VTE<br>% Completed risk assessment<br>% Appropriate prophylaxis<br>% Staff education<br>% Patient education | ?              |

\*QUM Quality Use of Medicines

There are many similar examples cited in the literature where short-term ‘project-status’ implementation studies have fallen short in meeting sustainability criteria. New ways of thinking are now being tested that incorporate concepts of capacity building for knowledge mobilisation. Kislov et al. (2014, p. 2) defines capacity building for knowledge mobilisation as ‘...a dynamic activity that augments capabilities to carry out functions or achieve objectives of knowledge mobilisation programs over the long term, leading to an improved provision of evidence-based health care’. Incorporating the constructs of organisational learning theory and the need to build capacity within the existing workforce and context, concepts such as diffusion fellows, knowledge brokering, communities of practice, clinical partnerships with researchers, mentoring, journal clubs and so on, may lead to the ‘...creation, expansion or upgrading of a stock of desired qualities and features called capabilities that could be continuously drawn upon over time’ (Kislov 2014, p. 2). The short- and long-term effectiveness of these new concepts and models on getting evidence into practice is still evolving. Their specific applicability to the JBI model for evidence-based health care and their incorporation into the evidence-utilisation component of the JBI model is yet to be determined.

In summary, knowledge translation efforts often take the form of a ‘project-status’ where there is a definitive ‘cut-off’ point to implementation activities and funding. This often occurs prematurely and at the cost of full implementation of all the

interventions. Even if success is achieved in changing practice, an additional challenge is ensuring the changes are sustained in routine daily care over time. Sustainability is an essential component in the implementation process that ensures patients' receive the best possible care and that investment in knowledge translation activities is not wasted. As demonstrated in this practical case study, translating evidence into practice in health care is messy, complex and uncertain (Kitson et al. 2008), and often can't be 'boxed' into a predetermined time frame. This creates a 'real-life' dilemma, as funding will always be limited and ongoing allocation of resources will be at the cost of other competing clinical needs. Researchers are testing alternative ways to knowledge translation by exploring various concepts for 'building capacity for knowledge mobilisation' using resources and expertise within existing clinical teams. This is a promising and feasible way forward and if proven to be effective, could well overcome the limitations of the 'project-status' model of change management. The JBI model incorporates the capacity for multiple action cycles that includes measuring the long-term sustainability of changes at 12 or more months post implementation. The evidence utilisation component of the JBI model, and possibly other planned action models, may benefit from being 're-packaged' to maximise their use by internal 'knowledge mobilisation' clinical teams who may not have had the benefit of attending a JBI training program.

#### **4.5 Chapter Conclusion**

The primary purpose of this master's study was to select an appropriate research implementation methodology, test its application in a practical case study on the prevention of venous thromboembolism, undertake a critique of the chosen approach and provide a recommendation for its use as a knowledge translation model at the study hospital. Whilst the analysis and critique of the model described in this chapter specifically illustrates its practical application to the VTE prevention project, it also serves to outline and highlight the key components of the JBI model. A specific and more detailed critique of the evidence utilisation component of the JBI model for evidence-based health care is provided in the thesis conclusion that follows this chapter summary.

The evidence utilisation component of the JBI model is inclusive of a planned action model that incorporates eight common phases, or steps, for getting evidence into practice. The JBI model was chosen as an appropriate methodology for a case study on the implementation of the best available evidence in the prevention of VTE in a large tertiary-referral teaching public hospital. Translational research is a new and emerging field and it is essential that implementation efforts are evaluated and reported in order to contribute to the accumulating evidence on what strategies work in practice, or don't work in a particular population, culture and setting. An effective model has not yet been established and researchers studying the science of knowledge translation require accurate and detailed descriptions of interventions reported in a consistent manner in order to synthesise results and generate scientific knowledge. This should apply to successful, partially successful and even unsuccessful implementation attempts. Much can be learned from sites that initiate the implementation of an evidence-based practice and then fail to reach milestones such as start-up or sustainability. All new knowledge can contribute to the emerging science base.

The use of a short-term, project-status change management model had been previously used in the study hospital. These 'projects' would have various levels of success and failure and were almost never evaluated for sustainability or conducted with consideration to any knowledge translation theoretical framework. This mostly reflected a 'sign of the times' with an absence of key personnel with any training or knowledge of translation research. The previous appointment of a Professor of Nursing with ties to the JBI afforded the support for two staff to attend the JBI Clinical Fellowship Program with associated practical studies in the prevention of postoperative delirium and the prevention of pressure injuries being undertaken at the study hospital. These activities created a platform for further studies using this methodology. More recently, the subsequent con-joint appointment of a Professor of Translational Research is reflective of a broader national and international recognition for strengthened ties between researchers and clinicians and to the increasing importance and benefit of knowledge translation activities. The appointment positions the study hospital and the

university with the ability to strategise on the best ways for building capacity in knowledge translation and for getting the best available evidence into practice.

The initiation of a short-term project to develop and implement a hospital-wide VTE prevention program was the result of a recommendation of the study hospital's serious incident panel. Although the evidence on VTE prevention, including clinical trials on the effectiveness of thromboprophylaxis regimes and multiple national and international clinical practice guidelines have been available for many decades, there was no standardised approach or guidance in place at the study hospital. The process for identifying this particular critical clinical problem was reactive and reflects the absence of a hospital-wide research and quality improvement agenda where a systematic and structured approach to identifying clinical priorities could be undertaken in a proactive manner and in consultation with clinicians, and even researchers, at multiple levels of the organisation and from multiple disciplines. Based on a critique of three different models and the recent success of two projects at the study hospital, the JBI model was adopted for use in a best practice implementation study on the prevention of VTE. Action research was the methodology adopted for use in the project and all three mechanisms of knowledge translation, 'push', 'pull' and 'exchange', were observed during the various knowledge translation phases and action cycles.

An experienced clinical academic who was also a JBI clinical fellow with previous experience in conducting a best practice implementation study was selected as an appropriate change agent and leader/facilitator for the project. Key stakeholders who were well known for their specific level of expertise and knowledge were invited to form a multidisciplinary team, who reported to, and received support from, two management/executive-level local opinion leaders. The project received no additional hospital funding and team members volunteered their time amidst existing clinical and administrative workloads. During the course of the project, and in recognition of the complexity and broad scope of the project, the clinical academic and the anaesthetist were allocated additional 'protected' time. JBI best practice recommendations and evidence summaries were considered in tandem with the results from a project baseline JBI audit. Major evidence-practice gaps in three of the four audit criteria were



identified with improvement required in the fourth audit criteria. A major action research cycle of consultation with key stakeholders was commenced. The project team considered this a critical element to any change strategy and proved to be a key success factor for establishing consensus on professionally crafted and localised clinical practice guidelines.

Context is an important factor in the assessment of a practice setting and its 'readiness for change'. Positive contexts for successful knowledge translation are characterised by transformational style leadership, empowering and learning work environments, open feedback on work performance and organisation size. The study hospital is a large tertiary-referral teaching public hospital characterised by a strong and supportive leadership style and a culture that includes decentralised, independent and autonomous decision-making, a patient-centred approach to the provision of high quality, safe, evidence-based care, and a highly qualified and competent workforce where continuing professional development is fostered and encouraged. Receptiveness to change at the organisational level, however, was hindered by a background of major health service reform, clinical re-design, hospital re-development, redundancies, financial constraints and limited infrastructure and information systems to support routine measurement and feedback on clinical performance.

The GRiP process of the JBI model includes the assessment of modifiable and non-modifiable barriers to the compliance with evidence-based practices and then tailoring interventions specific to each modifiable barrier with the identification of appropriate resources needed to implement each intervention. The project team identified multiple barriers at the individual, group and organisation level that required multifaceted interventions. The development of a comprehensive suite of printed education materials were not in themselves effective in changing professional behaviour but they did serve to create awareness to the best available evidence on VTE prevention, clarifying roles and responsibilities, and facilitating compliance with internal and external documentation requirements. The interactive education / consultation sessions with clinical staff were pivotal to achieving consensus and endorsement of the VTE prevention program and consensus hospital-wide guidance. The impact of local opinion leaders in influencing the attitudes and behaviour of peers at the

'practice group' level was evident but did not always translate into behaviour change at the individual level. The role of the NUM as a local opinion leader and effective change agent at the ward/unit management and clinical level was identified as critical and their cooperation and collaboration cannot be underestimated in the success of implementation programs.

Audit and feedback is classified as a moderately effective intervention strategy. The evidence utilisation component of the JBI model incorporates a baseline audit, feedback and follow-up audit mechanism as the basis for their model. Feedback of baseline audit results to clinicians proved to be enlightening and effective in bridging 'practice versus perception' gaps. The time lag between the baseline and the follow-up audit, however, was lengthy and this diminished the impact of results. Smaller, more frequent audit-feedback cycles may prove more effective in changing professional practice.

Electronic reminders and computerised CDSSs are proven to be very effective in improving compliance with evidence-based practice in VTE prevention programs. The study hospital does not currently have the information technology infrastructure or software systems to implement these capabilities. The project team reluctantly introduced an alternative paper-based risk assessment tool and associated VTE order sets. This was resource intensive to implement with significant issues in embedding the paperwork into routine clinical workflows and admission paperwork with resulting minimal compliance in documented VTE risk assessment reflected in the follow-up audit.

Monitoring compliance through follow-up clinical audit/s is an integral component of the evidence utilisation component of the JBI model and multiple cycles can be conducted as needed and entered into the on-line PACES program. Initial results showed varying compliance and a second action cycle is recommended in an attempt to further improve compliance, ensure intervention fidelity, and embed practices into routine daily care. This is a key 'stumbling block' when using a 'project-status' change management model as often funding and resources, and even support, for the project is withdrawn before the changes have been fully embedded into routine clinical practice. In addition to monitoring compliance with evidence-based practice recommendations, it is also considered important to

evaluate outcomes. This will determine the impact of using the evidence and whether it has made a difference to the patient, practitioner or systems outcomes. Clinicians requested outcome data during the consultation sessions and this data can provide a link between compliance with evidence-based practices and improved patient outcomes. The project team collected and reported on the rate of hospital acquired VTE events and observed a downward trend over a two-year period of the project. Whether this can be attributed to the establishment and partial implementation of the VTE prevention program cannot be proven.

Efforts and resources used to implement evidence-based practices are wasted if they are not 'institutionalised' and fully embedded into everyday routine care and sustained over time. The sustainability of knowledge translation efforts should be measured when interventions have been in place for more than a year after implementation or after the funding period is complete. Health care environments are dynamic and ever-changing and so the sustainability phase may set in motion a feedback loop that cycles through the action phases. Ongoing resources and commitment for this phase of the knowledge translation process, however, will be difficult and embedding this process into the organisation's quality improvement program may be an efficient option. New ways of thinking in how to approach knowledge translation over the long term are focussed on building capacity for knowledge mobilisation within existing clinical teams. Concepts such as diffusion fellows, knowledge brokering, and communities of practice hold some promise but are yet to fully tested and evaluated. A mid-19<sup>th</sup> century proverb states: 'Give a man a fish, and you feed him for a day; show him how to catch a fish and you feed him for a lifetime'. This analogy could be applied to the sustainability benefits of building capacity for knowledge mobilisation within existing clinical teams versus one-off, short-term, low-level projects with definitive cut-off points.

If getting research into practice was simple, if there was a one-answer solution, if it was easy to complete, the science of knowledge translation would not be emerging. But it is not simple and there is no one-answer solution – it is multi-layered, multi-faceted, multi-dimensional, complex and dependent on internal and external forces and resources that are usually context specific and constantly changing - and so 'one size' doesn't fit all. As McWilliams et al. (2009, p.9) states,

'Implementation science will therefore perhaps forever be as much art as science'.

#### **4.6 Thesis Conclusion**

The purpose of this thesis was to road test the JBI model for evidence-based health care in a best practice implementation case study on the prevention of VTE in an acute tertiary-referral teaching public hospital. The feasibility, appropriateness, meaningfulness and effectiveness of the JBI model for translating evidence into clinical practice and its impact on change within the organisation was the guide for analysis and critique to inform the health service of its applicability as a translation knowledge method for future use within the health service. The study provided an important critique of the JBI model that is missing in the translation science literature. The VTE prevention practice case study is presented as a research study in the form of a publication in chapter three, with the empirical evidence from the study mainly focusing on the implementation process.

The conclusion to this thesis will initially include an analysis and critique of the overarching JBI model for evidence-based health care as a conceptual framework. All four components of the model are integral to each other and each one constitutes an essential element in getting the best available evidence into practice. The specific focus of the practical case study, however, was the implementation of evidence into practice and, as such, the evidence utilisation component of the JBI model was analysed and critiqued separately.

#### ***Origins of the JBI Model***

The JBI model of evidence-based health care was initially developed and conceptualised by Pearson and colleagues and first published in 2005. It was constructed from their experience and work with the Joanna Briggs Institute over the preceding nine years and their examination of the scientific and professional literature. The JBI model continues to be developmental and emergent and builds on:

...frameworks that have evolved out of experience with the evidence-based practice field; the emerging international work of the Joanna Briggs Institute and the international Collaborating Centres...involvement in disseminating, implementing and evaluating evidence-based guidelines in clinical settings, and an examination of scientific and professional

literature' (School of Translational Health Science and The Joanna Briggs Institute, November 2013, p. 6).

In developing a framework for implementation science, JBI has drawn on the diverse and complex work of many implementation scientists (School of Translational Health Science and The Joanna Briggs Institute, November 2013, p. 11) with Pearson (2010, Chapter 9, p. 185) identifying the JBI model as '...essentially a framework for evidence-based health care that encourages the use of other models and frameworks'.

Pearson et al. (2005, p. 209) conceptualise evidence-based practice as 'clinical decision-making that considers the best available evidence; the context in which care is delivered; client preference; and the professional judgment of the health professional'. The model (See Fig. 2, Chapter 2) depicts four major components of the evidence-based health care process:

1. Evidence generation;
2. Evidence synthesis;
3. Evidence / knowledge transfer; and
4. Evidence utilisation.

The goal and end-point of any or all of the model components is global health that can be improved by changing behaviour in those at risk or those suffering from acute or chronic illness, and in health professionals and others who are responsible for delivering effective, evidence-based health care and policy.

Central to the model is a pluralistic approach to what constitutes legitimate evidence; an inclusive approach to evidence appraisal; extraction and synthesis; the importance of effective and appropriate transfer of evidence; and the complexity of evidence utilisation. The evidence utilisation component of the JBI model relates to the implementation of evidence in practice and is evidenced by practice and/or system change. There are three key elements to the evidence utilisation component: practice change; embedding evidence through system/organisational change; and evaluating the impact of the utilisation of the evidence on the health system, the process of care and health outcomes.

### ***JBI Conceptual Framework and Assessment Criteria***

Rycroft-Malone & Bucknall (2010) have developed 'framework and model assessment criteria' for the implementation of evidence into practice. This section of the thesis conclusion provides an analysis and critique of the broader JBI conceptual framework as it compares against these criteria. Ten dimensions for assessing the robustness and applicability of implementation frameworks and models have been developed. The first five dimensions relate to the framework or model's development and conceptual underpinning, while the other remaining five dimensions relate more to their specific use. The assessment of the JBI model conducted by the authors in relation to these criteria differs from the study hospital experience in using the JBI model in a practical case study on the prevention of VTE. Table 2 lists each dimension and compares the assessment from Rycroft-Malone & Bucknall (2010) with the experience of the case study hospital with using the JBI model.

**Table 2. Comparison of JBI Model with Framework and Model Assessment Criteria**

| Dimension                | Sub-dimension                           | Rycroft-Malone & Bucknall | Study hospital |
|--------------------------|---|---------------------------|----------------|
| Type                     | Model                                   | -                         | X              |
|                          | Framework                               | X                         | X              |
| Purpose                  | Descriptive                             | X                         | X              |
|                          | Explanatory                             | -                         | X              |
|                          | Predictive                              | -                         | -              |
| Development              | Inductive                               | X                         | X              |
|                          | Deductive                               | -                         | X              |
| Theoretical underpinning | Implicit                                | X                         | X              |
|                          | Explicit                                | -                         | X              |
| Conceptual clarity       | Yes                                     | X                         | X              |
|                          | No                                      | -                         | -              |
| Levels                   | Individual                              | -                         | X              |
|                          | Team/Unit                               | -                         | X              |
|                          | Organisation                            | X                         | x              |
| Situation                | Policy                                  | -                         | X              |
|                          | Hypothetical                            | -                         | -              |
|                          | Real                                    | X                         | X              |
| Users                    | Nurses                                  | X                         | X              |
|                          | Medics                                  | -                         | X              |
|                          | Allied health                           | -                         | X              |
|                          | Multidisciplinary                       | -                         | X              |
|                          | Policy makers                           | -                         | X              |
| Function                 | Assess facilitators & barriers          | X                         | X              |
|                          | Intervention/strategy development       | X                         | X              |
|                          | Outcome management & variable selection | -                         | X              |
| Testable                 | Yes                                     | -                         | X              |
|                          | No                                      | X                         | -              |

A rationale for cited differences in the assessment above, based on the experience of the study hospital with using the JBI model, are as follows:

|                           |  |
|---------------------------|--|
| Type                      | The JBI model of Evidence-Based Health Care is classified as a conceptual framework despite being named a model in the title. The difference between models and frameworks is their level of preciseness and attention to the processes of implementation (Rycroft-Malone & Bucknall 2010). The JBI model provides an overarching framework for evidence-based practice that includes four main components. One of those components, evidence utilisation, provides more specific detail on the processes and stages that could be used to implement evidence into practice and is therefore more reflective of a model within the broader JBI conceptual framework. |
| Purpose                   | The JBI model provides a descriptive analysis of its knowledge translation process but it also has the potential for explanation, as it identifies the components and mechanisms that need to be linked together for implementation. An explanatory framework helps understand the causal relationships between its different phases.  |
| Development               | The JBI model was originally developed inductively. It was conceived from the experience of the developers from within their experience at the JBI. Following its original conception / conceptualisation; research, reflection, refinement, and continuing development has ultimately led to a more precise and therefore more useful product. This indicates ongoing deductive development subsequent to the initial inductive conception.   |
| Theoretical underpinnings | Frameworks and models are underpinned by theory. The JBI model uses multiple theories, frameworks and models that include dominant theories about organisational systems, change management, knowledge translation, translation research and implementation science (Pearson cited in Rycroft-Malone & Bucknall 2010). The description and analysis included in this thesis suggests the phases or steps of the evidence utilisation component of the model are consistent with planned action theory.   |
| Conceptual clarity        | The elements, concepts and components of the JBI model, and its related resources and references are well described and are indicative of its usefulness as a framework/model and its contribution to the science of translation. By using the model, there is potential to stimulate new theoretical insights. For example, the selection and implementation of a particular intervention, and its effectiveness in changing practice and impact on knowledge use, could shed new light and insight. In addition, the plethora of empirical data that is collected and published also has the potential   |



|           |   |
|-----------|---|
|           | to provide new insights.  |
| Levels    | When designing implementation strategies it is important to determine what level the strategy is directed toward. The JBI model has been classified by Rycroft-Malone & Bucknall (2010) as targeting the organisation level. The JBI framework was created for use by both researchers creating the knowledge and end-users implementing the knowledge (Pearson et al. 2005). The design incorporates multiple levels that can occur independently or simultaneously. The evidence utilisation component, that includes the GRiP process, provides flexibility for targeting different levels (individual, team/unit and/or organisation) depending on the need for the evidence to be implemented. |
| Situation | The JBI model generates, synthesises and transfers robust evidence to both the policy and practice areas in a multitude of different types of settings and organisations. Pearson (2010, chapter 9, p.186) identifies the model as being useful for teaching in both undergraduate and postgraduate contexts to demonstrate the cycle of evidence that informs practice. This is a key element in the curriculum at the School of Translational Science based within the faculty of Health Science at the University of Adelaide, South Australia. Its use in hypothetical or simulation settings is not clear.   |
| Users     | The JBI model has been classified as being used only by nursing. The model evolved from nursing experience in implementing evidence-based changes for nursing care but its applicability to, and use by, different interdisciplinary user groups is now well recognised (Pearson, cited in Rycroft-Malone & Bucknall 2010) and as demonstrated in the VTE prevention project.   |
| Function  | The assessment of facilitators and barriers (situational analysis) and intervention/strategy development (action planning) is a core element of the JBI GRiP process. The evidence utilisation component of the JBI model is based on clinical audit using evidence-based criteria. Measuring process performance, evaluating outcomes, and assessing and measuring sustainability are all distinct and key phases of the JBI evidence utilisation planned action model. All three sub-dimensions for this criterion are applicable to the JBI model.   |
| Testable  | The JBI model is a practice model rather than a research model. The mechanisms of all four components of the model are supported by empirical data. Pearson (2010, chapter 9, p. 205) outlines numerous published uses of the model and its effectiveness in changing clinical practice in a multitude of differing clinical situations.  |

The differences in comparison of the JBI model as experienced in this research when compared to the ten dimensions developed by Rycroft-Malone & Bucknall (2010) are significant. Nevertheless, the JBI model is an evidence-based conceptual framework that continues to evolve as new knowledge is discovered and has been proven to be effective in this and other studies, and in the generation, synthesis, transfer and implementation of the best available evidence.

### ***JBI Strengths***

The strength of the JBI approach is that it is a 'one-stop-shop' for evidence-based health care processes and tools. There are five steps to evidence-based health care: searching; appraising; embedding, utilizing and evaluating. JBI on-line resources and services can be accessed at JBIConNECT+ via OvidSP and ProQuest. It is a one-stop portal to enable these five steps and it is unique to the JBI approach. The broader activities of the JBI also support the JBI model and these include the:

- ☐ Extensive research activities and the JBI role in developing the science of translation;
- ☐ Extent of the expert and high quality evidence, systems, resources and tools that are available on-line;
- ☐ Establishment of the international journal for evidence-based practice;
- ☐ Plethora of varied publications containing supportive empirical data;
- ☐ National and international education forums including conferences, conventions and symposiums;
- ☐ Academic and clinical training programs;
- ☐ Emerging social media presence;
- ☐ Growing focus on public and stakeholder engagement; and
- ☐ Ongoing commitment to collaboration with all levels of government, health care services and the community on the world stage.

### ***JBI Challenges***

It is proudly Australian-made and is a not-for-profit organisation that, by necessity, requires fee-based membership. This is a significant but unavoidable drawback for health services in being able to find the funds for the annual membership fee. An additional concern, from the experience of the study hospital, is the OvidSP requirement for a personal account and login to access

the on-line JBI resources. This is seen as a barrier to open, easy and fast access by staff and somewhat confusing as JBI maintain a separate website. In summary, the JBI model provides a comprehensive package in every aspect of evidence-based practice and knowledge translation but the provision of ongoing funding by financially constrained health services requires constant attention.

### ***JBI Model and Case Study Analysis***

The next part of this thesis conclusion specifically focuses on an analysis and critique of the evidence utilisation component of the JBI model as it was applied in the best practice implementation case study on the prevention of VTE.

### ***PACES Program***

The PACES on-line tool, available via JBICOnNECT+, is specific to the evidence utilisation component of the JBI model. There are two components to the program: an electronic database for managing before and after clinical audit data; and the on-line GRiP database work plan for problem identification, action planning and action taking. Pearson (2010, chapter 9, p. 187) explains that the program ‘...draws on approaches from the methodologies of clinical audit, participatory action research, clinical leadership and participatory change management’. The GRiP module emphasises the central role of clinical leaders in the implementation of change and is seen as fundamental to developing clinical leadership skills in others and to the utilisation of evidence in the clinical setting. Participatory action research was the methodology used in the VTE prevention project and this was an important component of the GRiP process.

In practice, the first step in using the PACES program is to login and complete the data requirements for each step as shown below in Table 4. This is compared against the eight common phases of a planned action model.

**Table 3. Comparison of JBI PACES Steps with Planned Action Model Phases.**

| <b>JBI PACES</b>  | <b>Planned action model phase</b>  |
|---|--|
| 1. Select a topic and associated evidence-based audit criteria  | Identify problem<br>Review evidence  |
| 2. Identify the cycle iteration e.g. baseline or follow-up 1 etc.   |  |
| 3. Identify an overseeing team and/or a data collection team  | Identify problem – change agent and key stakeholder team                           |
| 4. Select an audit type -clinician or organisation  |  |
| 5. Identify a sample size for each criterion – PACES program will automatically generate a sample size based on user data input for population, current compliance (%), and target compliance (%) |  |
| 6. For an organisation audit and/or multiple users– PACES program will automatically distribute the sample size amongst the various users/sites   |  |
| 7. Enter audit results for each criterion – Yes, No, N/A  |  |
| 8. Compliance report is generated according to cycle iteration  | Monitor compliance<br>Sustain knowledge use  |
| 9. Identify GRiP project lead and key stakeholders (can be same as data collection and/or overseeing team/s)  | Identify problem – change agent and key stakeholder team                           |
| 10. Identify and document individual barriers, action/s required to address each barrier, and the resources needed to implement each action (GRiP Process)  | Consider context<br>Assess barriers<br>Identify interventions<br>Implement changes |
| <b>Individual steps are selected and repeated as required according to project needs and cycle iteration</b>  |  |

### ***Evaluating Outcomes***

The JBI on-line tool related to the evaluation of outcomes is the POOL program and this is separate to, but can be used in conjunction with, the PACES program. Consequently, the 'evaluate outcomes' phase is the only phase not identified above. The POOL program was not used in the VTE prevention study as it was not a component of the JBI clinical fellowship training program and the project leader was unfamiliar with its' use. This highlights a pre-requisite need for training in the purpose and use of the various JBI products, although this is not an onerous or complicated process.

### ***Compliance Graphs***

A technical issue within the PACES program is identified at step eight: a compliance report is generated according to cycle iteration. The PACES compliance graph is only capable of comparing two sets of aggregated data at

any one time. This is a confounding scenario when there are multiple follow-up audits and/or there are multiple users/sites participating in the same audit cycle. The compliance graph is a critical component in the feedback of audit results to key stakeholders and alternative software is required to generate graphs with more than two sets of data. Monitoring improvements over time through various audit cycles is a valuable observation and teaching tool and presenting multiple sets of data in graphical form would be helpful through the on-line PACES program.

### ***JBI Planned Action Model***

The evidence utilisation component of the JBI model incorporates the eight common phases of a planned action model (see Table 3 above). Using this component of the JBI model for the VTE prevention implementation study provided a frame of reference for organised thinking and a guide for what to focus on and how to achieve change by completing the logical step-by-step progression through the phases. The PACES on-line resources underpinned this process in a practical and guided manner. A previous attempt to implement a state-wide evidence-based VTE prevention program by the study hospital failed. A successful second attempt has been attributed to the use of the evidence utilisation component of the JBI model and the facilitation of the project by a JBI clinical fellow with formal training and previous experience in implementation studies. A planned action approach and access to the JBI on-line resources increased the chances of a successful outcome.

### ***JBI Clarity***

According to the School of Translational Health Science and The Joanna Briggs Institutes', 'Strategy for Strengthening the Translation of Evidence into Action across JBI programs' (November 2013, pp. 14-16), there are three governing principles for the effective and sustained implementation of the best available evidence into policy and practice: understanding the culture; capacity building of both individuals and organisational systems; and supportive, reinforcing and sustaining infrastructure. These governing principles have guided the recent JBI development of a sequential seven step-process identified by the acronym CLARITY.

The JBI CLARITY cycle of evidence implementation is built into the existing audit, re-audit process and the structured approach to the identification and management of the barriers to change, but it does not directly parallel with the steps in the PACES process. The VTE prevention project leader attended the JBI clinical fellowship training program in 2012 and, whilst receiving training in the JBI evidence utilisation component of the JBI model and the PACES clinical audit program, is unfamiliar with the CLARITY cycle. This demonstrates the ongoing development and responsiveness of the JBI model to new evidence becoming available, but it also highlights the importance of effectively disseminating updates of programs to existing JBI fellows and JBI members. Currently, there is a PACES User manual accessible on-line, but a JBI User guide to evidence utilisation would be helpful for updating changes to the program, useful as a teaching tool in knowledge translation processes and informative for guiding novice practitioners in the JBI evidence utilisation program.

### ***Flexibility of the JBI Model***

Rycroft-Malone & Bucknall (2010) state the use of more than one framework or model to guide or underpin a single initiative is possible. As mentioned earlier, the JBI model encourages the use of other models and frameworks and there is flexibility within the model to incorporate this. Although not formally documented within the VTE prevention implementation process, the PARIHS assessment of readiness for change and the NICS Barrier Tool were both considered within the project GRiP process.

The VTE prevention study achieved only partial success in changing practice, as observed in the difference in compliance data between the baseline and follow-up audit cycles. The possible reasons for this have been discussed earlier, along with a recommendation for conducting a second audit cycle to reassess barriers and to fully implement existing and possibly new interventions in order to improve compliance. The reasons for the variable measure of success in the initial action cycle is not attributed to a failure in the JBI model but has been contributed to by a number of contextual and logistical barriers at the individual, ward/unit and mostly organisational level that can be addressed in a second JBI action cycle. There is scope and flexibility within the JBI model and the PACES program for

this to occur, including the capability for a twelve-month sustainability audit and evaluation phase.

### ***Engagement of key stakeholders***

Walsh and colleagues (2005, p.125) highlight the important need for the effective engagement of key stakeholders before embarking of any change management process that involves others:

Engagement is central to any human interaction where the object is to: understand another, develop a relationship, communicate effectively, solve a problem, or bring about change.

The JBI model does not specify how to engage stakeholders and/or clinicians in the evidence utilisation process. Undertaking a more structured approach to guiding clinicians in the process of engaging with each other around practice change would be beneficial in enhancing the process and effectiveness of the implementation process within the JBI model. The VTE prevention project team undertook a major action research cycle in the form of departmental consultation sessions early in the knowledge translation process. These proved critical and highly successful in informing and engaging clinicians about the project, understanding the context of the practice setting, identifying possible enablers and barriers, and achieving consensus on evidence-based practice in the prevention of VTE at the study hospital.

### ***JBI model and project status***

The evidence utilisation component of the JBI model, using the PACES program lends itself to a 'project-status' that has a defined start and finish time-frame – usually at the conclusion of the first follow-up audit and feedback report. Although this is not an intentional outcome of a project or indeed the JBI model, hospitals with limited resources and/or a poor understanding of the complexities of implementation science, may withdraw funding, resources or support at this stage of the implementation process thereby contributing to changes not being fully embedded and sustained in routine clinical practice with a subsequent waste of the intervention resources. This scenario has been realised with the VTE prevention study. The executive sponsor of the project, however, has requested

the submission of a business case to justify and lobby for resources to undertake a second audit cycle.

### ***JBI model and new ways of working***

Knowledge translation researchers are always questioning and testing new ways to approach the evidence-practice gap. Building capacity for knowledge mobilisation within existing clinical teams is promising and if successful, could address problems around short-term, low-level, 'project-status' activities and the sustainability of changes. Research and evaluation is ongoing in relation to the effectiveness of concepts such as the use of communities of practice, knowledge brokering and the use of diffusion fellows, to name a few. The future of the evidence utilisation component of the JBI model, the PACES program, and the JBI Clinical Fellowship training program and how they could be used and incorporated into these potential newer ways of working is worthy of consideration, even if just in terms of re-packaging the language for a better contemporary fit and for marketing purposes.

### ***Sustainability and JBI endorsement***

The study hospital has a proven commitment to evidence-based practice and knowledge translation as demonstrated by the ongoing commitment of funds for JBI membership, the con-joint appointment of a Professor of Translational Research with ties to the JBI, training support for two JBI clinical fellows and executive support for a number of best practice implementation studies. There is recognition that skills, training and expertise in knowledge translation needs to be expanded within the clinical workforce to grow capacity and to facilitate the utilisation of the best available evidence in every individual clinical transaction. The establishment of a JBI evidence utilisation group and/or a JBI collaborating centre at the study hospital can provide a structured and evidence-based approach to building on the current foundation, ensure future sustainability and ultimately achieve official JBI endorsement.

### ***Summary***

In summary, this study is an important critique of the JBI model for evidence-based health care and its applicability for continued use in the study hospital as a



feasible, appropriate, meaningful, effectiveness and economically viable model for evidence implementation.

Translational science addresses 'gaps' in the cycle of translating knowledge into action. The process of knowledge translation is viewed by JBI as one that needs to be inclusive and that accounts for all elements of the research cycle. The JBI model for evidence-based health care is a conceptual framework that incorporates four integral and interdependent components: evidence generation; evidence synthesis; evidence/knowledge transfer; and evidence utilisation. The goal and end point of any or all of the model components is global health and this can be improved by changing behaviour in those with acute or chronic illness, and in those who are responsible for delivering effective, evidence-based health care and policy.

In 2010, two well-known knowledge translation researchers developed ten criteria for assessing the robustness and applicability of implementation frameworks and models. The JBI model, amongst others, was assessed using these ten criteria. The assessment of the JBI model differed significantly from the experiences of the study hospital in using the JBI model. The assessment by the authors is not considered to accurately reflect the model's development or conceptual underpinnings, nor the specific usefulness of the model for implementation activities.

The evidence utilisation component of the JBI model relates to the implementation of evidence into practice and reflects a planned action model. The key difference of the JBI model from other planned action models is the availability of the on-line JBI resources. These are available through *JBICONNECT+* @ OvidSP requiring a personal login and password. The JBI also maintain a separate website, which can become confusing to users. Specific to the evidence utilisation component of the model is the PACES tool that incorporates an electronic database to manage clinical audit data and the GRiP database work plan for the development of a structured action plan. The JBI have recently developed a seven-step process, with the acronym CLARITY, to aid the effective and sustained implementation of the best available evidence into practice and policy. This sequentially stepped process does not parallel with the

steps in the PACES clinical audit and GRiP programs and requires clarification. The availability of a JBI evidence utilisation user manual would be helpful to both expert and novice practitioners.

The PACES program directly incorporates seven of the eight common phases of a planned action model, with the 'evaluate outcomes' phase being linked to the JBI POOL database. It would be beneficial for this phase to be directly incorporated, or directly linked, into the PACES program to emphasise its importance as a key step in the knowledge translation process. A further technical issue relating to the PACES program is the inability of the compliance graphs to report more than two sets of comparative data. This is problematic when there are multiple users and/or more than one audit cycle for feedback reports.

There are a number of strengths and weaknesses associated with the evidence utilisation component of the JBI model. Access to the JBI on-line resources and tools requires either organisation or individual membership and in the current climate of fiscal constraint, it becomes harder to succeed in gaining funds for new or continuing membership fees. Despite this, the JBI continues to grow world-wide and is considered an international leader in translation science. Capacity within the Research Translation Faculty of the NHMRC to partner with the JBI to facilitate availability of these on-line resources for all Australian hospitals could be innovative and potentially cost-effective. There is a pre-requisite for users of the PACES program to have training in the JBI model, the evidence utilisation component of the model and the PACES on-line program itself. This could be facilitated by existing JBI clinical fellows within the organisation but could be complimented by an 'evidence utilisation' user manual, particularly for novice users.

A previous attempt to implement a best practice VTE prevention program at the study hospital proved unsuccessful. The JBI model, and the project lead with training in the JBI model, was attributed as the difference in a second successful attempt. The JBI model provided a frame of reference for organised thinking and a structured and logical step-by-step progression through the phases, underpinned and guided by the PACES program. The reasons for the variable

measure of success in the initial action cycle is not attributed to a failure in the JBI model but has been contributed to by contextual and logistical barriers mostly identified at the organisation level. The evidence utilisation component of the JBI model is unintentionally perceived as having a 'project-status' with a defined start and finish timeframe, usually at the completion of the follow-up audit and report. Subsequent action cycles are recommended to ensure full implementation of all strategies and re-assessment of any new barriers. This approach is often not funded or supported by executive decision-makers and this ultimately impacts on the sustainability of changes with a subsequent waste of intervention resources.

Developers of the JBI model drew on the diverse and complex work of many implementation scientists and the flexibility of the model continues to allow for the use of other models and frameworks. Examples include the PARIHS conceptual framework and the NICS Barrier tool. Researchers continue to question and test new ways in how to approach bridging the evidence-practice gap with recent studies focussing on building capacity for knowledge mobilisation within existing clinical teams. These include concepts such as the introduction of diffusion fellows, knowledge-brokers, and communities of practice that appear to hold some promise and could counter-attack the limiting effects of short-term, low-level 'projects'. The integration of these new ways of working into the JBI model will be required.

The study hospital has a proven commitment to the implementation of evidence-based practice and translational research. Current and previous activities using the JBI model, coupled with the small, but growing number of staff with training and/or experience in using the JBI tools, has seen a growing recognition and support for the model within the organisation. The JBI model is a feasible, appropriate, meaningful and effective method for evidence utilisation, subject to ongoing funds. The intended application of the study hospital to qualify as a JBI collaborating centre and ultimately to gain internationally recognised JBI endorsement, places the study hospital on a clear pathway to improving patient and health/systems outcomes and bridging the evidence-practice gap.

#### 4.7 Recommendations

1. JBI model for evidence-based health care, and specifically the evidence utilisation component of the model, is a useful and effective program to aid the implementation of the best available evidence into practice in an acute public hospital. Ongoing organisation membership is recommended with an increased focus on evidence-based practice in the study hospital through its establishment as a JBI Collaborating Centre.
2. Technical issues relating to the PACES on-line program include:
  - a. The POOL program should be directly linked or incorporated into the PACES program to emphasise and identify the 'evaluate outcomes' component of a planned action model as a key component of an implementation process. Training on the POOL program should be incorporated into the JBI Clinical Fellowship program.
  - b. The ability of the PACES program to graph more than two sets of aggregated compliance audit data is essential.
  - c. The provision of an up-to-date on-line *Evidence Utilisation Manual* would benefit existing and novice practitioner users.
3. Effective engagement of key stakeholders before embarking of any change management process is essential to the success of an implementation process. The JBI model should incorporate and emphasise a more structured approach to guiding clinicians in the process of engaging with each other around practice change.
4. The NHMRC Research Translation Faculty should consider the establishment of a partnership with the JBI to make the on-line resources available to all Australian hospitals.
  - a. This would support financially constrained hospitals who cannot afford the JBI membership fee and who would benefit from accessing the considerable evidence-based resources and tools;
  - b. It would also establish a valuable platform for a consistent approach to implementation across public hospitals in Australia;

- c. The PACES on-line clinical audit program could also be revitalised / adapted to incorporate ward-based clinical audits for the ten National Safety & Quality Standards ensuring consistency across hospitals. Subject to agreement, these results could provide valuable comparative Australian hospital data for these key standards of patient care.

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# APPENDICES

## Appendix 1 Statement of Co-Authorship

### Statement of Co-Authorship (for inclusion in the thesis)

The following people and institutions contributed to the publication of work undertaken as part of this thesis:

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#### **Author details and their roles:**

***Paper 1, Prevention of venous thromboembolism amongst patients in an acute tertiary referral teaching public hospital: a best practice implementation project:***

*Located in chapter three*

*Candidate was the primary author (65% estimated contribution) with author 1 (20% estimated contribution), and authors 2, 3, 4, 5 and 6 (5% each estimated contribution) assisting with refinement and presentation.*

***Paper 2, Consumer engagement in the development of a video to inform health service clients about the risks and prevention of venous thromboembolism:***

*Located in chapter three*

*Candidate was the primary author (70% estimated contribution) with author 7 (30% estimated contribution) contributing to the idea, its formalisation and development.*

***Paper 3, Computerised Clinical Decision Support Systems: Rhetoric or reality?:***

*Located in chapter three*

*Candidate was the primary author (80% estimated contribution) with author 1 (20% estimated contribution) contributing to the idea, its formalisation and development.*

We the undersigned agree with the above stated "proportion of work undertaken" for each of the above published (or submitted) peer-reviewed manuscripts contributing to this thesis:

Signed: \_\_\_\_\_

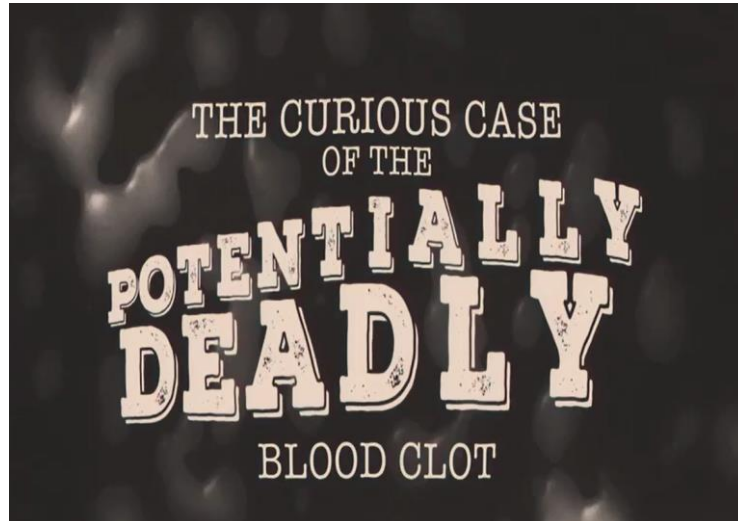
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Date: *10<sup>th</sup> August 2015*

## Appendix 2 Patient Education Video

An electronic copy of the video titled, 'The curious case of the potentially deadly blood clot' is available on request.



### ACKNOWLEDGEMENTS:

ROYAL HOBART HOSPITAL VTE PREVENTION PROGRAM


VIDEO PRODUCTION - ROSNY COLLEGE MEDIA STUDENTS 2015

SCRIPT - ANDREW WILSON AND CHRIS BELLEARS

LOCATION - UTAS SCHOOL OF NURSING & MIDWIFERY DOMAIN HOUSE



ROYAL HOBART HOSPITAL NURSES MUSEUM

### Appendix 3 Sample VTE Risk Assessment Form\_Standard Adult

|   |  |                             |
|---|--|-----------------------------|
| <br><b>Tasmania</b><br>Explore the possibilities | <b>RISK ASSESSMENT</b><br><br><b>VENOUS THROMBOEMBOLISM (VTE)</b><br><br><b>THO-South</b><br><br>Facility: _____ | PT ID: _____                |
|   |  | SURNAME: _____ D.O.B: _____ |
|   |  | OTHER NAMES: _____          |
|   |  | ADDRESS: _____              |

|  |                          |  |                          |
|--|--------------------------|--|--------------------------|
| All adult patients (18 years or older) are assessed for risk of VTE on admission to hospital using this tool.<br>Patients should be re-assessed whenever the clinical situation changes AND with change in care type or doctor AND weekly.<br>Pharmacological and mechanical prophylaxis is to be ordered on the National Inpatient Medication Chart.<br>Use antenatal or postnatal VTE risk assessment forms for all pregnant women up to and including 6 weeks postpartum. |                          |  |                          |
| Admission date: DD / MM / YYYY   |                          | DEFINITIONS TABLE (overpage)   |                          |
| <b>MEDICAL VTE RISK FACTORS</b>  | Tick all applicable      | <b>SURGICAL VTE RISK FACTORS</b>   | Tick all applicable      |
| Any tick for medical or surgical VTE risk should prompt thromboprophylaxis according to individual Department VTE Practice Guidelines for a <b>HIGH RISK</b> patient   |                          |  |                          |
| Age more than 60 years   | <input type="checkbox"/> | Total hip replacement with 'other' VTE risk factor/s                               | <input type="checkbox"/> |
| Prolonged immobility   | <input type="checkbox"/> | Total knee replacement with 'other' VTE risk factor/s                              | <input type="checkbox"/> |
| Active cancer  | <input type="checkbox"/> | Hip fracture surgery with or without 'other' VTE risk factor/s                     | <input type="checkbox"/> |
| Some forms of anti-cancer therapies (seek advice)  | <input type="checkbox"/> | Major long bone fracture surgery with 'other' VTE risk factor/s                    | <input type="checkbox"/> |
| History or strong family history of VTE  | <input type="checkbox"/> | Neurosurgery – cranial   | <input type="checkbox"/> |
| Thrombophilia  | <input type="checkbox"/> | Neurosurgery – spinal  | <input type="checkbox"/> |
| Morbid obesity : Body mass index (BMI) greater than 35 kilogram (kg) per metre squared (m <sup>2</sup> )   | <input type="checkbox"/> | Major trauma   | <input type="checkbox"/> |
| Ischaemic stroke   | <input type="checkbox"/> | Cardiothoracic surgery   | <input type="checkbox"/> |
| Acute myocardial infarction (AMI)  | <input type="checkbox"/> | Major abdominal cancer surgery   | <input type="checkbox"/> |
| Critically ill patients  | <input type="checkbox"/> | Major abdominal, pelvic or thoracic surgery or any surgery greater than 45 minutes | <input type="checkbox"/> |
| One or more significant medical comorbidities  | <input type="checkbox"/> | Any surgery with prior VTE and /or active cancer                                   | <input type="checkbox"/> |
| Use of oestrogen-containing Hormone Replacement Therapy (HRT)  | <input type="checkbox"/> |  | <input type="checkbox"/> |
| Use of oestrogen-containing contraceptive pill   | <input type="checkbox"/> |  | <input type="checkbox"/> |
| <b>NO MEDICAL RISK FACTORS</b>   | <input type="checkbox"/> | <b>NO SURGICAL RISK FACTORS</b>  | <input type="checkbox"/> |
| <b>CONTRAINDICATIONS/PRECAUTIONS to pharmacological prophylaxis</b>  | Tick all                 | <b>CONTRAINDICATIONS/PRECAUTIONS to mechanical prophylaxis</b>                     | Tick all                 |
| Any tick should prompt clinical staff to consider if bleeding risk is sufficient to preclude pharmacological intervention or need for dose adjustment and/or timing adjustment   |                          |  |                          |
| Active or recent bleeding within 48 hours  | <input type="checkbox"/> | Severe peripheral arterial disease   | <input type="checkbox"/> |
| High risk of bleeding  | <input type="checkbox"/> | Severe peripheral neuropathy   | <input type="checkbox"/> |
| Current therapeutic anticoagulation  | <input type="checkbox"/> | Severe lower limb oedema or deformity  | <input type="checkbox"/> |
| Adverse reaction or allergy to heparin or enoxaparin   | <input type="checkbox"/> | Recent skin graft or local surgery   | <input type="checkbox"/> |
| Heparin induced thrombocytopenia (HIT)   | <input type="checkbox"/> | Inflammatory conditions of lower leg   | <input type="checkbox"/> |
| Severe hepatic disease   | <input type="checkbox"/> | Inability to correctly fit stockings   | <input type="checkbox"/> |
| Severe renal impairment  | <input type="checkbox"/> | Known allergy to material manufacture  | <input type="checkbox"/> |
| Primary brain tumour or brain metastases with likelihood of haemorrhage  | <input type="checkbox"/> |  | <input type="checkbox"/> |
| Planned surgical procedure in next 12 hours  | <input type="checkbox"/> |  | <input type="checkbox"/> |
| Lumbar puncture/epidural/spinal anaesthesia within previous 6 hours or expected within next 12 hours   | <input type="checkbox"/> |  | <input type="checkbox"/> |
| <b>NO CONTRAINDICATIONS (PHARMACOLOGICAL)</b>  | <input type="checkbox"/> | <b>NO CONTRAINDICATIONS (MECHANICAL)</b>   | <input type="checkbox"/> |
| 1. <b>REFER</b> to individual department VTE practice guidelines located on the Pharmacy Department intranet site.<br>2. <b>DOCUMENT</b> patient's VTE risk assessment and <b>ORDER</b> pharmacological and mechanical prophylaxis in the VTE prophylaxis section on the National Inpatient Medication Chart.  |                          |  |                          |
| Print Name:  |                          | Designation:   |                          |
| Signature:   |                          | Date: DD / MM / YYYY   |                          |

## Appendix 4 Sample VTE Practice Guideline\_Surgical Services

|   |  |  |
|---|--|--|
| <br>Tasmania | Tasmanian Department of Health and Human Services<br>Royal Hobart Hospital<br><br><b>Venous Thromboembolism (VTE) Practice Guidelines</b><br>General, Gastrointestinal, Plastics, Vascular, Urology, ENT & Ophthalmology Surgery | <br>RHH<br>VTE Prevention Program<br>Toolbox<br>Risk assessment   Prophylaxis   Education |
|---|--|--|

All adult patients are assessed for risk of VTE on admission to hospital.

Patients should be re-assessed whenever the clinical situation changes AND with change in care type or doctor AND weekly.

Pharmacological and mechanical prophylaxis is to be ordered on the National Inpatient Medication Chart.

These recommendations are guidelines only and should not replace clinical judgment, individual goals of care or patient assessment.

**First line strategies of adequate hydration and early ambulation to prevent VTE should be considered for all hospitalised patients.**

| Clinical Features  |   | Recommended VTE Prophylaxis<br>(Unless contraindicated)  | Duration and Discharge Education   |
|--|---|--|--|
| HIGH RISK  | Major trauma  | <b>Prescribe:</b> Heparin 5000units SC BD or TDS. (The aim is to convert to enoxaparin 40mg SC daily as soon as possible)<br><br>Apply IPC +/- TED as soon as possible and continue until fully mobile   | <b>Duration:</b> Start as soon as bleeding risk is acceptable and continue until ambulating.   |
|  | Major abdominal, pelvic or thoracic cavity surgery <u>OR</u><br>Any surgery > 45 mins   | <b>Exception:</b><br><b>Neck procedures (e.g. uncomplicated thyroidectomy or parathyroidectomy)</b> TED +/- IPC only<br><b>Otherwise prescribe:</b> Enoxaparin 40mg SC daily. Commence ≥ 6h after surgery. A wound check may be required prior to administration.<br><br>Apply IPC +/- TED intraoperatively or on completion of surgery and continue until fully mobile  | <b>Duration:</b> 5-10 days or until fully mobile<br><br>(Extended prophylaxis after discharge may be required for some patients based on clinical judgement)   |
|  | Any surgery with prior VTE and/or active cancer   | <b>Prescribe:</b> If on current anticoagulation therapy- refer to anticoagulation guidelines. Otherwise: Enoxaparin 40mg SC daily<br><br>Apply IPC +/- TED intraoperatively or on completion of surgery and continue until fully mobile  | <b>Duration:</b> 5-10 days or until hospital discharge   |
| LOW  | All other surgery, AND<br><br>Any patients awaiting residential care placement and/or patients awaiting admission to a rehabilitation program who are mobilising at least 50m three times per day | Promote adequate hydration and mobilise as able.<br><br>Consider Enoxaparin 40mg SC daily if 'other' VTE risk factors are present – see below.   | <b>Duration:</b> Until fully mobile or on hospital discharge   |
|  | Adjusted dosing may be required in renal impairment or extreme overweight or underweight.<br>(see over for more details)  |  |  |
| Discharge planning and Patient education<br>Ensure extended recommendations are included in transfer documentation /discharge letter and GP notification.<br>Provide patient education on VTE risk, prophylaxis administration & complications   |   |  |  |
| Other Risk Factors   |   | Contraindications or Precautions to Pharmacological Prophylaxis  | Contraindications to Mechanical Prophylaxis  |
| <ul style="list-style-type: none"><li>• Age &gt; 60years</li><li>• Prolonged immobility ≥ 3 days</li><li>• Some forms of chemotherapy</li><li>• Previous history of VTE</li><li>• Strong family history of VTE</li><li>• Thrombophilia</li><li>• Morbid obesity BMI &gt;35</li><li>• Ischaemic stroke</li><li>• Acute myocardial infarction (AMI)</li><li>• One or more significant medical comorbidities</li><li>• Oestrogen-containing HRT or contraceptive pill</li><li>• Pregnancy or puerperium with other risk factors</li></ul> |   | <ul style="list-style-type: none"><li>• Active or recent bleeding e.g GI or CNS bleed; haemorrhagic stroke</li><li>• High risk of bleeding e.g thrombocytopenia (platelet count &lt;50x10<sup>3</sup>/L), thrombophilia</li><li>• Current therapeutic anticoagulation</li><li>• Adverse reaction to LDUH or LMWH</li><li>• Severe hepatic disease</li><li>• Severe renal disease</li><li>• Primary brain tumour or brain metastases with likelihood of haemorrhage</li><li>• Planned surgical procedure within next 12h</li><li>• Lumbar puncture/epidural/spinal anaesthesia within previous 6h or expected within next 12h</li></ul> | <ul style="list-style-type: none"><li>• Severe peripheral arterial disease</li><li>• Severe peripheral neuropathy</li><li>• Severe lower limb oedema or deformity</li><li>• Recent skin graft or local surgery</li><li>• Inflammatory conditions of lower limb</li><li>• Open wound/s of the lower limb</li><li>• Inability to correctly fit stocking</li><li>• Known allergy to material of manufacture</li></ul> |

**Abbreviations:** TED Thrombo-Emboic Deterrent compression stockings; IPC Intermittent pneumatic compression; BMI Body mass index; HRT Hormone replacement therapy

This protocol has been developed for the RHH practice setting only. It is intended to guide practice and does not replace clinical judgement, individual goals of care or patient assessment. Modification will occur according to internal audit processes and literature review.

Custodian: Surgical Services Issued: Dec 2013. Effective Date: June 2014 Review Date: June 2016



There are two types of therapies that reduce the risk of developing VTE: anticoagulants and mechanical devices. These are commonly used in combination to improve the overall effectiveness of thromboprophylaxis in higher risk patients. Thromboprophylaxis measures, both mechanical and pharmacological, are to be prescribed on the NIMC based on a patient's VTE risk assessment including consideration of individual contraindications. If thromboprophylaxis measures are not instituted, the reasons must be clearly documented in the patient's medical record. Refer RHH VTE Prevention Protocol.

### ANTICOAGULANT PROPHYLAXIS

Enoxaparin and Low Dose Unfractionated Heparin (LDUH) and in some orthopaedic circumstances Factor Xa Inhibitors (e.g. Rivaroxaban) are the preferred agents used for VTE prevention at the RHH. The use of an antiplatelet agent such as Aspirin can be used as an adjunct to thromboprophylaxis in some circumstances. The main adverse event from these drugs is bleeding and they should not be administered if contraindications to their use (e.g. high risk bleeding) exist. While dosage recommendations have been included on the reverse of this guide, there is a requirement for doctors to select the dose, dosage interval and type of prophylaxis according to the clinical situation. Further information relating to drug interactions should be sought from product information.

| Prophylaxis Agent | Dose      | Administration | Frequency | Timing  | Reversible   |
|-------------------|-----------|----------------|-----------|---|--|
| Enoxaparin        | 40mg*     | SubCut         | Daily     | With hold 12h pre surgery<br>Restart from 6h post surgery | 60-70% reversible with protamine sulphate<br>Contact Haematologist on call |
| Heparin           | 5000units | SubCut         | BD or TDS | Intra-operatively, or<br>commence within 6h post surgery  | Reversible with protamine sulphate<br>Contact Haematologist on call        |

\* For patients with renal impairment (eGFR <30ml/min/1.73 m<sup>2</sup>) reduce the dose by 50% or change agent to heparin. (Creatinine clearance (CrCl) remains the gold standard for assessing renal function and should be checked for patients at age or weight extremes – patients with a CrCl <30ml/min require a reduction in enoxaparin dose by 50%).

\* For patients who are outside a normal weight range (i.e. extremely overweight or underweight) dosing by a weight-based regimen should be considered.

|          |                       |
|----------|-----------------------|
| <50kg    | Enoxaparin 20mg daily |
| 50-120kg | Enoxaparin 40mg daily |
| >120kg   | Enoxaparin 60mg daily |

If the preferred agents are deemed unsuitable, alternative agents are available on the Tasmanian Public Hospital Formulary.

### Neuraxial anaesthesia (e.g. epidural or spinal)

|            |   |   |
|------------|---|---|
| Enoxaparin | With hold 12h prior to needle / catheter <b>insertion</b><br>(With hold 24h if on therapeutic dose)<br>With hold 12h prior to catheter <b>removal</b> | Delay next dose 6h post needle /catheter <b>insertion</b><br>(Delay 24h if traumatic insertion)<br>Delay next dose 2h after catheter <b>removal</b> |
| Heparin    | With hold 4-8h prior to needle / catheter <b>insertion</b><br>Check APTT if on heparin infusion<br>With hold 4-8h prior to catheter <b>removal</b>    | Delay next dose 2h post needle /catheter <b>insertion</b><br>(Delay 24h if traumatic insertion)<br>Delay next dose 2h after catheter <b>removal</b> |

### Heparin Induced Thrombocytopenia (HIT)

HIT is a rare but dangerous complication of heparin administration. It is mainly associated with unfractionated heparin but it can occur with enoxaparin. HIT typically develops 5-10days after administration of heparin and a diagnosis of HIT should be considered if a platelet drop of greater than 50% from baseline occurs in a patient that has received heparin. Specialist advice should be sought if HIT is suspected. **A platelet count is to be obtained at baseline and as clinically indicated for inpatients receiving heparin prophylaxis.** Platelet monitoring is not recommended for patients receiving enoxaparin on discharge for extended prophylaxis.

### MECHANICAL PROPHYLAXIS

There are three types of mechanical devices that are used in the prevention of VTE: Thrombo-Emboic Deterrent (TED) stockings, Intermittent Pneumatic Compression (IPC) devices and Venous Foot Pumps (VFPs). The efficacy of the various mechanical options is measured by increased blood flow velocity from the leg: TED 38 percent; IPC 140 percent; VFP 150 percent.

**Note:** VFP use is (1) contraindicated in patients with severe congestive heart failure where increase of fluid to heart may be detrimental, and (2) restricted to patients who cannot be fitted with TED / IPC, undergoing TKR and some conditions of the lower leg.

- All mechanical prophylaxis devices must be measured and fitted for the individual patient. For measuring guidelines please refer to the manufacturers guidelines. Record measurements and size of garment in the progress notes.
- Patient and clinician compliance is essential e.g. no folding or rolling of stockings (tourniquet effect). Apply stockings and IPC prior to surgery whenever possible. Mechanical prophylaxis should be continuous from time of immobility to return of full ambulation and be insitu for approx. 18hrs/day for maximum effectiveness.
- Remove daily for hygiene care and check each shift for correct placement, skin integrity assessment and neurovascular status.
- Not to be used on patients with contra-indications to mechanical compression (see over).
- Early ambulation is encouraged and the use of mechanical devices should not impede this.

### PATIENT EDUCATION

Resources: Patient education video (hospital TV channel) and NHMRC 'Blood Clots: Reducing your risk' prevention brochure. Document patient education has been provided in the patient progress notes.